

NATIONAL BANK OF POLAND WORKING PAPER No. 85

A fiscal outlook for Poland using Generational Accounts

Janusz Jabłonowski, Christoph Müller, Bernd Raffelhüschen

Janusz Jabłonowski – National Bank of Poland, Świetokrzyska 11/21, 00-919 Warsaw, Poland (Phone: +48-22-653-26-47, email: janusz.jablonowski@nbp.pl)

Christoph Müller – Forschungszentrum Generationenverträge (Research Center for Generational Contracts), Albert-Ludwigs-Universität Freiburg (Freiburg University), D-79085 Freiburg, Germany (Phone: +49-761-203-9226, email: christoph.mueller@vwl.uni-freiburg.de).

Bernd Raffelhüschen – Forschungszentrum Generationenverträge (Research Center for Generational Contracts), Albert-Ludwigs-Universität Freiburg (Freiburg University), D-79085 Freiburg, Germany

We would like to thank Tomasz Jędrzejowicz, Grzegorz Kula, Iga Magda, Kamil Rakocy, Joanna Stachura, Paweł Strzelecki, Izabela Tomczyk, Anna Wronka, Arne Leifels, Christian Hagist, Jasmin Häcker, Stefan Moog and Johannes Vatter for valuable comments. We would like to thank as well the discussants of the ECB WG PF Workshop held in Cracow, 21.06.2010, and especially Bernhard Manzke, for the remarks. All errors remain our own.

This paper should not be reported as representing the official views of the National Bank of Poland.

Design:

Oliwka s.c.

Layout and print:

NBP Printshop

Published by:

National Bank of Poland
Education and Publishing Department
00-919 Warszawa, 11/21 Świetokrzyska Street
phone: +48 22 653 23 35, fax +48 22 653 13 21

© Copyright by the National Bank of Poland, 2011

<http://www.nbp.pl>

List of contents:

List of abbreviations	7
Abstract	8
1. Introduction	9
2. The methodology of the Generational Accounting	11
2.1. Methodology	11
2.2. Indicators	13
3. Assumptions and data.....	15
3.1. Methodological assumptions.....	15
3.2. Data	17
3.2.1. Population projection.....	17
3.2.2. Fiscal data	19
3.2.3. Micro-profiles.....	21
3.2.4. Growth and discount rates	22
3.2.5. Limitations of the GA method	23
4. The sustainability of the Polish fiscal system	27
4.1. Pensions paid by ZUS	27
4.1.1. Brief description of the NDC scheme	27
4.1.2. Computation procedure for NDC pensions	29
4.1.2.1. Computation procedure for bridging pensions.....	36
4.1.2.2. Computation procedure for miners' pensions	38
4.1.2.3. Computation procedure for minimum pensions	39
4.1.2.4. Generational Accounts for the ZUS pension fund	41
4.1.2.5. Annual Cash Flows	45
4.1.2.6. Fiscal gaps and sustainability indicators for the ZUS pension fund.....	48
4.2. Other types of social insurance provided by ZUS	50
4.2.1. Disability insurance fund	50
4.2.2. Computation procedure for disability benefits	52
4.2.3. Sickness insurance fund	53
4.2.4. Computation procedure for sickness and maternity leave benefits	54
4.2.5. Insurance fund for accidents at work.....	54
4.2.6. Generational Accounts, Fiscal Gaps and Sustainability Indicators for other types of social insurance provided by ZUS	55
4.3. Social insurance scheme for farmers.....	59
4.3.1. Computation procedure for farmers' pensions, disability, and survivors' benefits	61

4.3.2. Generational Accounts, Fiscal Gaps and Sustainability Indicators for farmers' social benefits system.....	63
4.4. Civil servants' social benefits system.....	64
4.4.1. Computation procedure for civil servants' pensions, disability, and survivors' benefits	65
4.4.2. Generational Accounts for civil servants' social benefits system	65
4.4.3. Fiscal Gaps and Sustainability Indicators for civil servants' social benefits system.....	67
4.5. The healthcare system.....	69
4.5.1. Computation procedure for the healthcare system	70
4.5.2. Generational Accounts for the NFZ.....	73
4.5.3. Fiscal Gaps and Sustainability Indicators for the NFZ	76
4.6. Education	79
4.6.1. Generational Accounts for education	79
4.6.2. Fiscal Gaps and Sustainability Indicators for education.....	82
5. The sustainability analysis of the entire public finances.....	83
5.1. Generational Accounts for Poland	83
5.2. Fiscal gaps and sustainability indicators for Poland	84
6. Conclusions and outlook	90
Appendix 1: Sensitivity Analysis.....	93
Appendix 2: Applied micro profiles	95
References:	102

List of Figures

Figure 1: Structure of Polish population	19
Figure 2: The development of the age dependency ratio in Poland.....	19
Figure 3: Growth rates of employment, real wages, and the real wage bill.....	23
Figure 4: The Structure of Contribution rates in 2010	28
Figure 5: Monthly average gross income in Poland, age brackets 17-68, in 2008.....	30
Figure 6: Probability to be an FDC participant in 2009.....	30
Figure 7: NDC contribution rates.....	31
Figure 8: monthly NDC contributions per contributor	31
Figure 9: Probability to contribute to NDC, male	32
Figure 10: Probability to switch from KRUS to NDC, male.....	32
Figure 11: NDC contributions per capita of population.....	33
Figure 12: NDC accounts per contributor	33
Figure 13: Pension level per capita of male contributor, in PLN, in 2018, $g=0\%$	34
Figure 14: Probability to retire in the new system	35
Figure 15: Change of the expected pension benefit per capita of population, in PLN	35
Figure 16: Expected number of bridging pensioners.....	36
Figure 17: Expected bridging pension costs, discounted and not discounted, in real terms of 2007, in million PLN	36
Figure 18: Projected number of miners.....	38
Figure 19: Projected number of retired miners.....	39
Figure 20: Expected minimum pension costs in real terms of 2007, per capita, PLN	40
Figure 21: Generational accounting and FGB of ZUS pensions - no 1999 reform, 2007, $r=3\%$, $g=1.5\%$	41
Figure 22: Generational accounting of ZUS pensions – status quo and no 1999 reform, 2007, $r=3\%$, $g=1.5\%$	42
Figure 23: Generational Accounts and FGB – new reform proposals, $r=3.0$, $g=1.5$, 2007	43
Figure 24: Generational Accounts for miners' pensions, $r=3.0$, $g=1.5$, in real terms of 2007	44
Figure 25: FGB for miners' pensions, $r=3.0$, $g=1.5$, in real terms of 2007	45
Figure 26: ZUS development of pension revenues & expenditures reform scenarios	46
Figure 27: ZUS development of pension revenues & expenditures reform scenarios ($g=1.5$, $r=0$).....	46
Figure 28: ZUS development of pension revenues & expenditures cumulated effect of reforms' scenario ($g=AWG$, $r=0$)	47
Figure 29: Fiscal gaps of ZUS old age pension system in different reform scenarios; $g=1.5$, $r=3.0$	48
Figure 30: Required subsidies until the phase out of the pre1999 pension system ($g=AWG$, $r=0$).....	49
Figure 31: Disability contribution rates, %, years 1999-2009	51
Figure 32: Revenues and expenditures of the disability fund in years 2005-2009.....	51
Figure 33: Profile differences between disability beneficiaries in 2005 and in 2007, in million PLN	52
Figure 34: Revenues and main aggregates of expenditures of the sickness fund, in million PLN, 2007	54
Figure 35: Revenues and main aggregates of expenditures of the Insurance fund for accident at work, in million PLN, 2007.....	55
Figure 36: Generational Accounts and FGB for ZUS disability fund, 2007	55
Figure 37: Cash flows development forecast for Disability Insurance Fund, $g=1.5$, $r=0$, base year 2007	56
Figure 38: Sustainability gaps for disability in the case of different retirement scenarios	57
Figure 39: Generational Accounts and FGB for ZUS Insurance fund for accidents at work, 2007, in million PLN	57
Figure 40: Generational Accounts and FGB for ZUS sickness fund, 2007, in million PLN	58
Figure 41: Comparison of sustainability gaps between different types of benefits provided by ZUS, 2007, % of GDP	59
Figure 42: Number of insured persons and beneficiaries in FER, years 1991-2009.....	60
Figure 43: Projection of participation rates in KRUS pension system	62
Figure 44: Development of FER revenues and expenditures. Scenarios with outflow and no-outflow, ($g=1.5$, $r=0$), 2007	62

Figure 45: Generational Accounts for farmers' pension and disability fund, 2007	63
Figure 46: FGB for farmers' pension and disability fund, 2007	64
Figure 47: Generational Accounts for civil servants social benefits system, 2007, in thousand PLN, $r=3\%$, $g=1.5\%$	66
Figure 48: FGB for civil servants, 2007, in thousand PLN, $r=3\%$, $g=1.5\%$	67
Figure 49: Development of old age pensions expenditures for civil servants, $r=0\%$, $g=1.5\%$	68
Figure 50: Development expenditures/revenues inflow of civil servants into ZUS, $r=0\%$, $g=1.5\%$	69
Figure 51: Number of insured persons and actual healthcare contributors, 2007.....	71
Figure 52: Healthcare contributions per capita of population, 2007, PLN	72
Figure 53: NFZ expenditures costs per capita of population, 2007, PLN.....	72
Figure 54: Generational Accounts for NFZ, $g=1.5\%$, $r=3.0\%$, 2007, in thousand PLN	74
Figure 55: Generational Accounts for NFZ with additional cost pressure scenario, $g=1.5\%$, $r=3.0\%$, 2007	75
Figure 56: Sustainability gaps for NFZ with additional cost pressure scenario, $g=1.5\%$, $r=3.0\%$, 2007	76
Figure 57: FGB for NFZ, with additional cost pressure scenario, $g=1.5\%$, $r=3.0\%$, 2007.....	76
Figure 58: Development of healthcare contribution rate closing sustainability gap, 2007, $g=1.5\%$, $r=3\%$	77
Figure 59: Development of long term care profiles, per capita, 2006.....	78
Figure 60: Generational Accounts for education, 2007, in thousand PLN, $r=3\%$, $g=1.5\%$	80
Figure 61: Sustainability gap for education, different fertility scenarios, 2007, $r=3\%$, $g=1.5\%$	80
Figure 62: Different fertility rate options	81
Figure 63: FGB for education, 2007, in thousand PLN, $r=3\%$, $g=1.5\%$	82
Figure 64: Generational Accounts for Poland, $g=1.5\%$, $r=3.0\%$, 2007.....	84
Figure 65: Sustainability gap for Poland, $g=1.5\%$, $r=3.0\%$, 2007, % of GDP	85
Figure 66: Future Generations' Burden for Poland, $g=1.5\%$, $r=3.0\%$, 2007, in thousand PLN	86
Figure 67: Isolated Sustainability Gaps of the parafiscal and other subsystems	87
Figure 68: Isolated Sustainability Gaps of the parafiscal and other subsystems (in balanced cash budget scenario).....	88
Figure 69: Demographic sensitivity analysis for the sustainability gap of the entire Polish public finances, 2007, $g=1.5\%$, $r=3\%$	93
Figure 70: Sensitivity analysis of the growth and discount rate for the sustainability gap of the entire Polish public finances, 2007, $g=1.5\%$, $r=3\%$	93

List of tables

Table 1: Assumptions of the demographic scenarios.....	17
Table 2: Selected revenue and expenditure categories of the 2007 general government, in billion PLN	20
Table 3: NFZ revenues for different groups of the population, 2007, in billion PLN.....	71

List of abbreviations

AWG: Ageing Working Group (European Commission)
 CSO= GUS
 CIT: corporate income tax
 DB: defined benefit
 FDC: funded defined contribution,
 FER: Fundusz Emerytalno-Rentowy (*Pension and Disability Fund*)
 FGB: Future Generations' Burden
 FR: Fertility rate
 FRD: Fundusz Rezerwy Demograficznej (*Demographic Reserve Fund*)
 GA: Generational Accounting
 GAs: Generational Accounts
 GUS: Główny Urząd Statystyczny (*Central Statistical Office*)
 KRUS: Kasa Rolniczego Ubezpieczenia Społecznego (*Social Insurance Fund for Farmers*)
 LTC: long term care
 MoF: Ministry of Finance
 NDC: notional defined contribution
 NFZ: Narodowy Fundusz Zdrowia (*National Healthcare Fund*)
 PAYG: pay-as-you-go
 PIT: personal income tax
 RCG: Research Center for Generational Contracts
 ZUS: Zakład Ubezpieczeń Społecznych (*Social Insurance Institution*)

Abstract

During the next few decades the populations of most developed countries will grow older and older as a result of the low fertility rates since the 1970s and/or the continuously increasing life expectancy. Poland, one of the biggest countries in Central Europe, will be confronted rather seriously by this development. Generational Accounting which was introduced in the early nineties, can illustrate the effects of this ageing process on a country's fiscal situation. We show that the demographic development produces a major problem for the long term stability of Polish public finances. In particular the healthcare system deserves special attention for policy makers in the medium and long run, whilst the general pension system shall stabilise in the long term.

Key words: Generational Accounting, Fiscal sustainability, Fiscal policy, Poland, Pension reform

JEL Classification: H50, H55, H60, H68, J10, H30

1. Introduction

“Insolvency” has recently become a standard expression in the media. However, this time the reference is not (only) made to the business sector but in fact to European governments. Clearly, the trust in the stability of public finances has been severely undermined in recent months translating *inter alia* into considerably higher financing costs on the capital market. The current economic downturn will be a challenge for public finances in the years to come. Yet, another challenge is gradually arising, which will, probably even more profoundly and for a much longer time-span, affect government finances: the ageing population. Poland, one of the biggest countries in Central Europe, will be confronted rather severely by this development. No other EU country (except Slovakia) will experience such a rapid rise of the number of elderly people relative to the working population in the coming 50 years. This process can have severe consequences for the stability of public finances via increasing age-related social benefits burden imposed on a shrinking working population. Against this background the question arises whether the Polish fiscal system can be sustained in the long term. Traditional methods of cash/accrual deficit and nominal debt measures focus only on the current development of fiscal situations. Therefore, long term stability indicators have to be chosen to answer this question. This study provides a sustainability assessment of the fiscal system, applying, for the first time in the case of Poland, the methodology of Generational Accounting (GA). On this basis we aim to bridge to some extent the gap of sustainability examinations for Poland. The methodology of GA was developed initially by Auerbach, Gokhale and Kotlikoff (1991, 1992 and 1994), who sought to illustrate the effects of intergenerational policy. After all, probably nearly every piece of legislation affects not only living but future generations as well. Since the early 90's, GA has become a broadly recognized method to measure fiscal sustainability. For the last 15 years several GA studies for 29 different countries¹ have been incorporated into professional literature. Some countries like Norway even include GAs in their government reports.

With this study we aim to provide not only an assessment of the sustainability of the overall Polish fiscal system but also of its smaller subsystems. On this basis we seek to evaluate which isolated subsystems cause the biggest threat to the stability of Polish public finances in the long term. Therefore, we modified the usual approach based only on the analysis of the entire public finance sector, by dividing it into the smaller subsystems: pensions of various kinds (e.g. ZUS, civil servants' and KRUS), disability and survivors benefits, healthcare, and education.

Besides the analysis of intergenerational burdens this study aims to outline the need for action. A number of reforms have been introduced in the past years such as e.g. the profound pension reform of 1999. At present already new modifications of the pension system are discussed. Against this background we want to assess whether the sweeping 1999 pension reform was sufficient to ensure fiscal sustainability of the ZUS pension fund. One focus of this study shall, therefore, be on the evaluation of the reformed general pension system based on the new notional defined contribution scheme (NDC). Due to the complexity of this reform we deviate from the standard GA approach of projecting present benefit and contribution profiles into the future. In fact, we compute future NDC pensions on the basis of the actual NDC accounts, altered retirement probabilities and changing (age-specific) participation rates in the new NDC-system. Furthermore, we aim to take into account in the case of Poland the transformation of specific features, such as the transformation of the farming sector.

The paper is structured as follows: chapter 2 describes briefly the method of GA and the calculation of the sustainability indicators used. The sources of data used for these calculations are reported in chapter 3. Here the focus is on data regarding the population

¹ 15 of these countries have been estimated in cooperation with the RCG.

1

development, age- and sex-specific benefits as well as contribution (tax) profiles and the aggregated general government budget. Furthermore, we discuss in chapter 3 our choice for global parameters (growth and discount rates). With the following chapter 4 we provide the results of the Generational Accounting analyses using different kinds of sustainability indicators. After an examination of isolated fiscal systems – namely of the general pension system, other types of social security benefits provided by ZUS, the farmers' and civil servants' social security system, public health care (NFZ) and education – we finally take a broader perspective on the entire general government in chapter 4. Each subsection referring to an isolated subsystem contains separate, detailed technical description of the computation procedures. Chapter 5 summarizes the paper giving additionally an outlook on future research.

2. The methodology of the Generational Accounting

To measure the sustainability of a country's public sector we use the method of *Generational Accounting* developed by Auerbach, Gokhale and Kotlikoff (1991, 1992 and 1994)². In contrast to traditional budget indicators which are based on annual cash flow budgets, Generational Accounting is founded on the intertemporal budget constraint and therefore the long-term implications of a current policy can be computed.

2.1. Methodology

The intertemporal budget constraint of the public sector, expressed in present value terms of a base-year b is:

$$(1) \quad B_b = \sum_{k=b}^{b-D} N_{b,k} + \sum_{k=b+1}^{\infty} N_{b,k}$$

Let D denote agents' maximum age and $N_{b,k}$ the present value of year b 's net tax payments, i.e. taxes paid net of transfers received, made by all members of a generation born in year k over the remaining lifecycle. Then, the first right-hand term of equation (1) represents the aggregate net taxes of all generations alive in the base-year b . The second term aggregates the net tax payments made by future generations born in year $b + 1$ or later. Together this is equal to the left-hand side of equation (1), B_b , which stands for the net debt in year b . That

means if the sum of all living generations' net taxes, $\sum_{k=b}^{b-D} N_{b,k}$, is negative (i.e. if they receive a net transfer) and the net debt, B_b , positive, the sum of future generations' net taxes has to be positive to balance the government's intertemporal budget i.e. in a long-term perspective net transfers received by living generations plus the net debt of the base-year have to be financed by net taxes paid by future generations.

To calculate generations' aggregated lifecycle net tax payments, the net payment terms in equation (1) are decomposed into:

$$(2) \quad N_{b,k} = \sum_{s=\max(b,k)}^{k+D} T_{s,k} P_{s,k} (1+r)^{b-s}$$

In equation (2), $T_{s,k}$ denotes the average net tax paid in year s by a representative member of the generation born in year k , whereas $P_{s,k}$ stands for the number of members of a generation born in year k who survive until year s . To compute the remaining lifetime net payments of living generations, the future demographic structure is specified conducting long-term population forecasts.

Typically, Generational Accountants disaggregate equation (2) even further. To incorporate gender-specific differences in average tax payments and transfer receipts by age, separate aggregation of the average net taxes paid by male and female cohort members is required. The products aggregated in equation (2) represent the net taxes paid by all members of generation k in year s . For generations born prior to the base-year the summation starts from year b , while for future born cohorts, the summation starts in year $k > b$. Irrespective of the

² The further description of the methodology of Generational Accounting is mainly based on Raffelhüschen (1999) and Bonin (2001). For an analytical derivation of the intertemporal budget constraint see Benz and Fetzter (2006) or Fetzter (2006). Hagist (2008) gives an overview of the empirical studies with generational accounting along with a discussion concerning critical points in theoretical as well as empirical terms.

Typically, Generational Accountants disaggregate equation (2) even further. To incorporate gender-specific differences in average tax payments and transfer receipts by age, separate aggregation of the average net taxes paid by male and female cohort members is required. The products aggregated in equation (2) represent the net taxes paid by all members of generation k in year s . For generations born prior to the base-year the summation starts from year b , while for future born cohorts, the summation starts in year $k > b$. Irrespective of the year of birth, all payments are discounted back to the base-year b by application of a real interest rate r .

The age-specific net tax payment in year s of agents born in year k can be decomposed as

$$(3) \quad T_{s,k} = \sum_i h_{s,k,i}$$

$h_{s,k,i}$ stands for the average tax or transfer of type i paid or received in year s by agents born in year k , thus of age $s - k$.³ In equation (3), $h > 0$ indicates a tax payment, whereas $h < 0$ defines a transfer.

Applying the method of Generational Accounting it is conventionally assumed that the initial fiscal policy and economic behaviour are constant over time. Under this condition it is possible to project future average tax payments and transfer receipts per capita from the base-year age profile of payments according to

$$(4) \quad h_{s,k,i} = h_{b, b-(s-k),i} (1 + g)^{s-b}$$

where g represents the annual rate of productivity growth. Equation (4) assigns to each agent of age $s - k$ in year s the tax and transfer payment observed for agents of the same age in base year b , uprated for gains in productivity. The base-year cross section of age-specific tax and transfer payments per capita is generally determined in two steps. First, the relative position of age cohorts in the tax and transfer system is estimated from micro-data profiles. In a second step the relative age profiles are re-evaluated proportionally to fit the aggregated expenditure and tax revenues of the base-year.

For living and future generations, the division of the aggregate remaining lifetime net tax payments by the number of cohort members alive in year s defines the cohort's Generational Account in year s :

$$(5) \quad GA_{s,k} = \frac{N_{s,k}}{P_{s,k}}$$

Generational Accounts are constructed in a purely forward-looking manner, only the taxes paid and the transfers received in or after the base-year are considered. As a consequence, Generational Accounts cannot be compared across living generations because they incorporate effects of differential lifetime. One may compare, however, the Generational Accounts of base-year and future born agents, who are observed over their entire lifecycle.

³ In the case of analysis of the isolated subsystems of public finances, like health care or pension as conducted in the following chapters, i is just chosen so that all relevant payment streams are included in the analysis.

2.2. Indicators

The Sustainability Gap

To illustrate the fiscal burden of current fiscal policy we use seven sustainability indicators.⁴ The starting points for the first indicators are the intertemporal public liabilities which can be computed by the assumption that the intertemporal budget constraint of the public sector (1) is violated:

$$(6) \quad IPL_b = B_b - \sum_{k=b-D}^{\infty} N_{b,k}$$

The amount of intertemporal public liabilities measures aggregate unfunded claims on future budgets, assuming that the present policy will hold for the future. The first sustainability indicator, the sustainability gap (SG_b), can be derived if the intertemporal public liabilities are set in relation to base-year's GDP (GDP_b). This indicator is akin to the debt quota well known since the Maastricht Treaty but it addresses the debt which will occur in the future and in the past:

$$(7) \quad SG_b = \frac{IPL_b}{GDP_b}$$

Future Generations' Burden

How the policy adjustment required to redeem intertemporal public liabilities will affect generations' fiscal burdens depends on the policies addressing this burden. For illustrative purposes, Generational Accounting typically assigns the entire adjustment to future generations which is equivalent to $k > b$. All tax payments made by members of future born cohorts are adjusted proportionally with the help of a uniform scaling factor θ . The factor θ is set to ensure balance of the intertemporal public budget defined in equation (1):

$$(8) \quad h_{s,k,i} = \theta \times h_{b, b-(s-k),i} (1+g)^{s-b}$$

for and instead of equation (4). In computing the average age-specific net taxes paid by representative future born agents, the burden for future generations can be illustrated as an absolute difference between the Generational Account of the base-year agent and the Generational Account of the agent born one year after the base-year. This is our second sustainability indicator, the future generations' burden:

$$(9) \quad FGB = GA_{b,b} - GA_{b, b+1}^{\theta}$$

Revenue and Transfer Gap

The third indicator that illustrates the burden of current fiscal policy is the revenue gap. In this case the scaling factor $\theta = \theta_{rev}$ reflects the enhancement of age-specific revenues in per cent for all generations which is necessary to close the intertemporal public budget constraint. It can also be interpreted as the ratio of the intertemporal public liabilities to the present value of all age-specific revenues of the fiscal system:

⁴ For a discussion of measuring fiscal sustainability and the development of sustainability indicators, see Raffelhüschen (1999) and Benz and Fetzer (2006).

$$(10) \quad \theta_{rev} = \frac{IPL_b}{\sum_{s=b}^{\infty} Rev_s \cdot \frac{1}{(1-r)^{(s-b)}}$$

with Rev_s referring to the sum of revenues in year s by all living generations in year s . Analogous to the revenue gap, we compute also the so-called transfer gap. In this case the scaling factor $\theta = \theta_{trf}$ reflects the necessary decrement of age-specific public transfers (Trf) like health benefits in per cent for all generations that is necessary to close the intertemporal public budget constraint. Constructing the revenue and transfer gap, we implicitly assume that the government is able to enforce an immediate adjustment of all taxes and contributions or transfers respectively.

As Benz and Fetzner (2006) have shown all the used indicators are computed with an infinite time horizon. In the practical calculation all relevant variables like population or cohorts' tax payments are projected for 300 years from the base-year on. Afterwards a geometrical serial is used to determine the remaining net tax payments. The choice of 300 periods is nearly completely arbitrary and just reflects a good approximation point for our analysis.⁵

⁵ Due to the higher level of discount in relation to the growth rate fiscal flows in the very far future do not play a large role for our present value calculation since they are highly discounted. Therefore, it has only a marginal effect if one ends the projection after 300 years instead of 300 + x years.

3. Assumptions and data

3.1. Methodological assumptions

The following section aims at giving additional rationale to the methodology described in chapter 2.1. As summarized by Bonin (2004), the GA usually analyzes the sustainability of the fiscal policy at the level of the entire general government sector⁶. However, the authors decided to take one step further and to check whether more detailed insight into separated GAs for selected components of the general government is possible.

After a decade since the introduction of the 1999 pension reform, the question is raised if there is a need to change some of its features. Furthermore, there's the question whether the initial reform was sufficient to stabilize the pension system in long term. Another doubt concerns the impact on sustainability of public finances of other age related types of expenditures, e.g. disability benefits or healthcare. In search for more precise answers about the stability of subsystems we wanted to divide the whole general government into smaller substructures, and analyze them separately.

Therefore, in addition to the usual GA approach, we decided to introduce the *isolations* of the most prominent age-specific categories of public finances into smaller subsystems, logically consistent, to follow their expected individual development in the future and to be able to evaluate this individual impact on (un)sustainability of the whole system. The above mentioned term '*logically consistent*' used for isolated subsystem, is obviously insufficient and open for interpretation. Here we refer to an isolated system in 'financial' terms, i.e. external financial inflows are frozen, but we allow flows of contributors and beneficiaries between isolated subsystems⁷. Our approach to isolation is based on the following observations of the non-financial side of the public budgets:

As in the case of the base year, all consecutive budgetary years in the forecast data consist of two sides: revenues and expenditures, spread into the micro-profiles, discounted to the present value. Expenditure side usually is treated in accordance with the national accounts accrual principle: cash expenditures plus accrued current 'short' term liabilities in the base year. Revenue side is treated in national accounting more prudentially- here only cash flows are considered. But the revenue side also triggers off some other discussions, since in the case of isolated subsystems the uncertainty over the revenue projections is high. There are at least two options: with additional co-financing from the external sources (e.g. intergovernmental transfers), or financing based only on 'own' resources. The definition of own resources can be further interpreted, but here we recognize them as directly collected in the budgeting process by the isolated subsystem for own economic purposes. An example is provided by the pension or healthcare contributions, directly subtracted from employees' gross income, before the taxation process.

What could the consequences of our distinction be? In principle we see two probable options here:

- lower deficit⁸ (higher surplus or balanced budget) in the case of additional external transfers, and,
- higher deficit in the case we considered only own resources as those which should be recorded on the revenue side.

⁶ To our knowledge, there are only few exceptions to this rule: by Baker et al. (2002), at the Federal State level. However, the study by Baker is methodologically different, since his GA for each State reflects a "full" spectrum of revenue and expenditure categories at regional level, whilst our isolations are based on selected and separated subcategories from general, not regional government. Furthermore, Deeg et al. (2009) in their Fiscal Outlook for Austria propose an approach to isolations more comparable to ours.

⁷ E.g. disability pensioners inflow to ZUS pension scheme, Or farmers who leave farmers' pension fund In the future are transferred to US pension scheme.

⁸ Certainly, other options are possible, depending on the relation between revenues and expenditures (surplus or balance). In our approach we gave practical examples, which should explain the broader logic.

It brings us to the discussion on the sustainability indicators and sustainability as such. Depending on the interpretation and assumed *prudence level*, the isolated system can meet the sustainability criteria depending on the revenue option. It can be regarded as e.g. sustainable in the first case, and unsustainable in the second option. A more general application of the rule requires further research since the budgets of selected governmental units or schemes can consist of different types of items. However, our exercise based on the above rationale gives interesting results in the case of Poland.

Bearing in mind the mentioned traps, we distinguish two types of subsystems, which differ in terms of approach to the revenue side:

- 1) Subsystems with own revenues (e.g. directly collected social contributions) specifically dedicated to the given category of benefits (expenditures). For instance, in the pension system the NDC (ZUS) accounts were isolated – provided that the levels of current transfers from the state budget or loans from the banks are volatile, and are provided due to secondary division of resources on the basis of governmental decisions. For this group of subsystems only contributions, or other primarily own resources, versus benefits were analyzed. Such an approach can be justified by the assumption of logical links in economic agents' perception between fiscal burdens paid for specific purposes of the state activity (e.g. pensions) and the benefits derived from the same category of fiscal transfers.
- 2) Subsystems without dedicated revenues, e.g. the Polish civil servants social assistance⁹ scheme, where all expenditures are covered directly from the budget (in fact the system is *always* balanced by revenue from taxpayers), were treated as follows: to given annual expenditures, the respective amount of revenues balancing a cash deficit was artificially separated. As the expenditure side is projected by the model into the future, in accordance with the demographics and growth, the revenue side is progressing too. However, while in the case of the expenditure side we generally apply a rather detailed age and gender specific profile, this is not the case for the revenue side (in the case of the civil servants, social insurance and the education system). Here we use a flat profile. In other words we spread all "revenues" necessary to cover base year expenditures equally over the entire population. This is, of course, a very conservative assumption since the working population is financing indirectly via taxes the biggest part of the civil servants and education expenditures. The revenue side is, therefore, growing independently of the expenditure side, taken from the base year. The subsequent difference in the following years between progressing revenues and expenditures shall transform into surplus or deficit, due to e.g. changing dependency ratio. This assumptions raise doubts, since state pension obligations to civil servants shall be *always* satisfied by law. However, authors followed this line of experiment to find an answer to the question if and to which extent the subsystems from the second category of isolation may contribute to the overall (un)sustainability of public finances, if they were virtually separated.

On the one hand the two above-mentioned methods of isolations may be very interesting, especially from the practical point of view, since an isolated set of sustainability indicators may give researchers and policy makers a much more profound insight into each subsystem. On the other hand, the modified method poses several dangers to the consistency and assessment of achieved results, due to the influence of e.g. one-off inter- and intra-governmental flows or other forms of financial support, which often remain unspotted at the level of consolidated general government. Additionally, a significant role for the evaluation of the financial wealth of isolated subsystem may be played by e.g. financial assets and liabilities. Net government wealth is taken for computations at the level of general government, but from the point of view of some subsystems the separation of some assets may be more disputable.

⁹ According to SNA2008.

3.2. Data

To calculate the Generational Accounts and the indicators stated in Chapter 2 we require a population projection, the general government revenues and expenditures for the base year 2007, age-sex specific profiles for various types of revenues and expenditures, the growth rate of productivity and the respective discount rate. Due to the lack of all the required data for 2008 we have chosen to set 2007 as a base year¹⁰. Therefore, all numbers and values are in present values of 2007 if not stated otherwise. Certain profiles in the baseline scenario were adjusted and rescaled to their expected shape in the future, to reflect the effects of recent reforms (e.g. personal income tax, disability contributions). The population projection in the following section is calculated by means of a demographic program developed by Bonin (2001).

3.2.1. Population projection

The projections used to compute the baseline scenario of generational accounts are based on the 2008 population projection of the Eurostat, which is consistent with the available national forecasts of the CSO.

Based on different assumptions about the three parameters, i.e. life expectancy, fertility and migration it is possible to derive a population projection for each of the demographic scenarios. Own calculations are necessary for the reason of GA assumed infinite time horizon: the official projections end in 2060 while we need approximately 300 years projection period. For these calculations we rely on the data and assumptions of Europop 2008 (convergence scenario) which give assumptions on the above mentioned parameters until the year 2060. After this year the demographic parameters are held constant. Table 1 shows those central assumptions for our standard scenario. Additionally, further demographic scenarios are illustrated which shall be used for the sensitivity analysis in the Appendix 1.

Table 1: Assumptions of the demographic scenarios

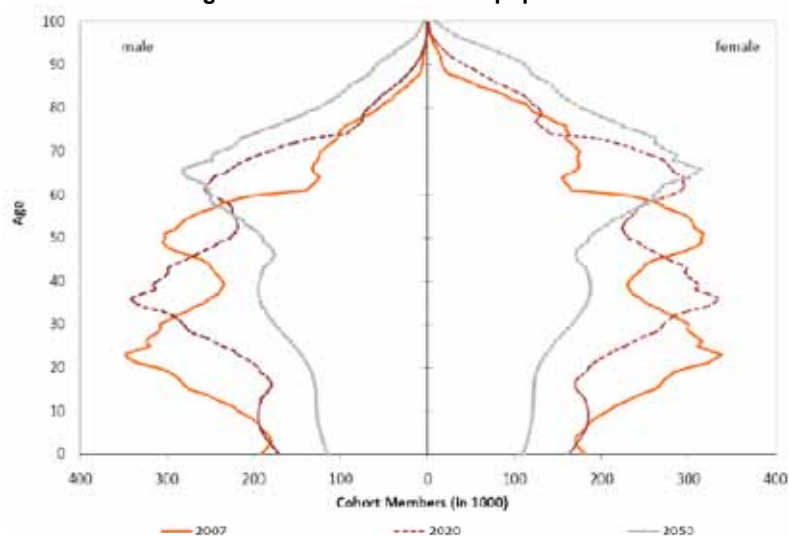
	Standard scenario	Higher Fertility scenario	Lower Fertility scenario	Higher Life expectancy
Female life expectancy at birth in 2007	79,7	79,7	79,7	79,7
Male life expectancy at birth in 2007	71,0	71,0	71,0	71,0
Female life expectancy at birth in 2060	88,0	88,0	88,0	89,0
Male life expectancy at birth in 2060	82,5	82,5	82,5	83,5
Fertility - 2007	1,31	1,31	1,31	1,31
Fertility - 2060	1,49	1,59	1,39	1,39
Net migration 2007	-20.485	-20.485	-20.485	-20.485
Net migration 2060	8.154	8.154	8.154	8.154

¹⁰ In several places the two other base years were used, but only as a reference to 2007, to show broader perspective. These additional base years are 2005 and 2006. All such additional references were adequately highlighted in the text and in the tables or charts.

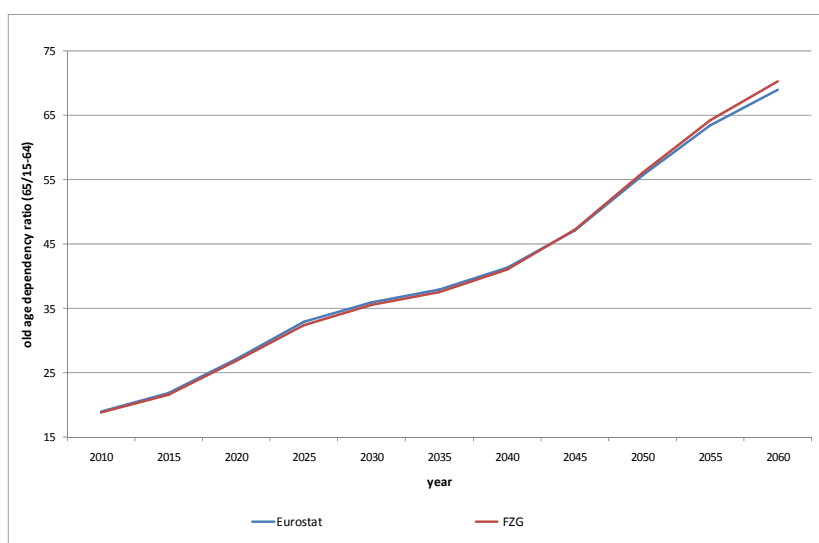
	<i>Lower Life expectancy</i>	<i>Base year migration</i>	<i>Zero migration</i>	<i>Very old</i>	<i>Very young</i>
Female life expectancy at birth in 2007	79,7	79,7	79,7	79,7	79,7
Male life expectancy at birth in 2007	71,0	71,0	71,0	71,0	71,0
Female life expectancy at birth in 2060	87,0	88,0	88,0	90,0	82,0
Male life expectancy at birth in 2060	81,5	82,5	82,5	85,0	75,0
Fertility - 2007	1,31	1,31	1,31	1,31	1,31
Fertility - 2060	1,39	1,49	1,49	1,2	1,8
Net migration 2007	-20.485	-20.485	0	-20.485	-20.485
Net migration 2060	8.154	-20.485	0	-20.485	30.000

Figure 1 illustrates our population projection – the main basis for our GA calculations. It is said that demography reflects to a great extent the history of the respective country. This becomes apparent when looking at Poland's age specific population structure in the base year 2007. First of all, one can clearly identify the impact of World War II on the cohorts born between 1941 and 1946. As commonly observed during periods of war and unrest, birth rates were relatively low, resulting in relatively small cohorts aged around 60 in 2007. After the end of World War II the fertility rate recovered quite rapidly, which led to strong cohorts aged 45 to 60. During the 1960s and 1970s the total fertility rate decreased from nearly 3.0 to 2.2 children per woman. This explains the drop in the birth rate, which can be observed around the age group of 40 in 2007. The subsequent gains in birth numbers can be traced back to the fact that the respective cohorts have been born by those aged 45 to 55 in 2007. Due to the fact that these are quite large in numbers, their children are numerous as well. After the opening of the Iron Curtain in 1989, however, Poland displayed a steep fall in natality—as in most formerly communist countries. In order to project Poland's demographic future, assumptions about fertility rates and life expectancy for the coming decades are needed. In accordance with most other population projections, such as Europop (conducted by Eurostat) we assume that the fertility rate will remain at its low present level of roughly 1.3 children per woman. The assumed evolution of life expectancy in Poland is broadly similar to the rest of Europe. While an average male (female) born in 1990 could expect to live for 66.3 (75.3) years, this value is assumed to rise to 71.0 (79.7) for a male (female) born in 2007. In comparison to most other EU countries this increase in life expectancy by almost four months per year is particularly fast. According to Eurostat (2009) life expectancy of a male (female) newborn will further increase by around eight (five) years until 2050.

Both, declining fertility rates and the ongoing and rather steep increase in life expectancy lead to a significant ageing process in Poland. As a result, the Polish population pyramid's appearance will considerably change in the coming decades (see Figure 2). The pace of this aging process is exceptional—compared with other European countries. This can be illustrated by the old-age dependency ratio, defined as the number of persons aged 65 and older, relative to those between 15 and 64. As illustrated in Figure 2, this indicator will rise from about 20 percent in 2010 to roughly 70 percent in 2060, which is a steeper increase than in any other EU country, except Slovakia. The demographic development of this kind puts substantial pressure on a pay-as-you-go (PAYG) pension system and can thus be understood as the main reason for the sweeping pension reforms that are described in detail in chapter 4.1.1. As Figure 2 outlines, our demographic projection (coded FZG here) follows relatively closely the forecast of the Eurostat. Only in the very long term we slightly deviate from this benchmark population projection.

Figure 1: Structure of Polish population

Source: own calculations based on Eurostat data

Figure 2: The development of the age dependency ratio in Poland

Source: own calculations

3.2.2. Fiscal data

The pattern for aggregated entries on the revenue and expenditure side reflects available micro-profiles. Therefore, revenues consist mainly of value added tax and excise, personal (PIT) and corporate (CIT) income taxes, social contributions, property income and other current revenues, sales and capital revenues.

In the case when we could derive age and gender specific profiles for revenue items, the overall category of other revenues was assigned, with a flat profile. Categories of taxes reflect those paid by working population and pensioners, since each of them consists of a different set of probabilities. The social contributions were divided into detailed aggregates according to available micro-profiles for the purpose of pensions, disability and survivors,

accident insurance, sickness insurance and healthcare. We managed to create 14 entries for age and gender specific revenues of the general government.

The aggregates for expenditures also were matched in accordance with the age specific micro-profiles provided by several institutions or estimated on the basis of statistical surveys. In our opinion the often used COFOG categories of expenditures are not sufficiently adapted to the requirements of age and gender specific expenditures. For instance, the function 'old age expenditures' encompasses altogether pensions paid by the ZUS and KRUS. In principle our aim was to separate the aggregates, which would allow for isolations, as stated in our assumed *ad hoc* definitions from chapter 3. The main categories of expenditures derived from the available dataset cover: pensions paid from ZUS, KRUS and to civil servants, respective social benefits for: disability, survivors, sickness, maternity leave, accident at work, several healthcare services, education and unemployment. Due to the special importance of the ZUS pension reform effects from 1999, ZUS pensions have been further divided into: NDC pensions, miners' pensions and minimum pensions. Many COFOG functions, like general administration, defence or environmental protection are consumed equally by all agents in the economy, so for them the single category of 'government purchases' was created with a respective flat per capita of population micro-profile. Finally, interest payments and EU flows were excluded from the dataset in accordance with the standard methodology of the GA.

The fiscal year 2007 was chosen as a base year, but to be able to reflect possible effects of the fiscal reforms (PIT, disability contributions), and to update the dataset to existing fiscal developments, all micro-profiles were adjusted to the real terms of 2008, and in several cases – to preliminary data of 2009. All in all, we evaluate the sustainability of Polish general government from the perspective of primary deficit net of the effects of EU accession, additionally affected by fiscal reforms and economic downturn of 2009. Selected categories of revenues and expenditures for the base year are shown in Table 2.

Table 2: Selected revenue and expenditure categories of the 2007 general government, in billion PLN

ZUS pension contributions	41,0	ZUS pensions	-67,4
Miners' pensions contributions	1,9	ZUS minimum pensions	-2,0
Bridging Pensions' Fund	0,0	Miners' pensions	-6,3
ZUS disability contributions	34,9	Bridging pensions	0,0
ZUS accident contributions	4,6	Farmers' pensions	-8,5
ZUS sickness contributions	7,5	ZUS sickness benefits	-3,6
Farmers' contributions	1,2	ZUS maternity benefits	-1,4
PIT work	56,8	ZUS accident benefits	-3,8
PIT pensions	4,8	ZUS accident benefits (survivors)	-0,5
VAT	96,2	ZUS disability benefits	-11,9
Excise	45,5	ZUS survivors' benefits	-20,3
NFZ work	36,3	Farmers' disability benefits	-2,1
NFZ pensions	5,9	Farmers' survivors' benefits	-0,3
Other current and capital revenues	137,8	Civil servants' pensions (Justice)	-0,2
		Civil servants' surv. (Justice)	-0,1
		Civil servants' pensions (Defence)	-3,0
		Civil servants' disability (Defence)	-0,5
		Civil servants' survivors (Defence)	-0,9

Civil servants' pensions (InternAff)	-3,5
Civil servants' disability (InternAff)	-0,3
Civil servants' survivors (InternAff)	-1,0
Civil servants' pensions (PrisonServ)	-0,5
Civil servants' disability (PrisonServ)	-0,1
Civil servants' survivors (PrisonServ)	-0,4
Basic medical health care	-4,7
Medical specialist services	-3,1
Dentists' services	-1,3
Long-term home health care services	-0,7
Hospital treatment	-18,6
Other NFZ expenditures	-12,0
Other healthcare expenditures	-13,2
Primary and secondary education	-56,1
Higher education	-10,7
Unemployment benefits	-2,2
Active forms of dealing with unemployment	-2,7
Government purchases	-207,2

Source: Own calculations based on budgetary data

So far we explained in details how we aim to compile the implicit side of the government debt. In addition to this, the standard methodology adds up the explicit general government debt, corrected for present value of privatization receipts or any other assets to be disposed in the future as a relief in the debt repayment. In our computations we correct the explicit liabilities for the relatively small amount of the FRD, to be spent in 2010. Authors do not include the other potential government assets due to high uncertainty of their expected value. On the other hand, we omit also the potential growth of the government explicit debt stemming from contingent liabilities: e.g. probable payments of government guarantees for some branches of the economy or potential claims for private wealth confiscated by the state in the past. In consequence, the current version of the GA shows the full amount of the net implicit liabilities and the explicit government debt, amounting to 529.3 bn (45% of GDP in the base year) – corrected for the base year present value of 7.5 bn of FRD resources to be used in 2010.

3.2.3. Micro-profiles

On the revenues side the data to calculate the old-age-pension, disability pensions, sickness allowances and accident-at-work and occupational diseases' contributions profiles were available upon request from the Social Insurance Institution (ZUS). The source data for

pension and invalidity contributions were provided by Farmers' Social Insurance Fund (KRUS). Data on the number of insured persons in the healthcare system were provided by the National Healthcare Fund (NFZ), though this information was used only as a benchmark for checking out consistency. Due to a lack of source data, which during the preparation of our report were unavailable in the MoF, we estimated the PIT on the basis of an income profile for the working population. However important limitations of quality shall be addressed. To our knowledge, the official data on effective PIT rates, published on the MoF website, refer only to taxpayers whose incomes are subject to taxation under general rules. Under these rules (in the base year) three nominal PIT rates were applied: 19%, 30% and 40%, with the predominant role of the first one (over 90%). According to our estimates the general government revenues from PIT, under the above described general taxation rules, amounted to 72% of overall PIT revenues (44 out of 61 bn). The missing part comes from linear taxation paid by entrepreneurs and from lump sum payments by the self-employed. The VAT and excise profiles were elaborated on the basis of the survey on household consumption (CSO, 2007). For each type of household (employees, self-employed, farmers and pensioners) the effective VAT or excise rates were applied on given average amounts of consumer goods and services. Unfortunately, the described method was in our opinion insufficient, since it allowed to cover only 27% of overall VAT revenues (26 out of 96 bn¹¹) and 24% of all excise revenues (11 out of 45 bn). These results are definitely not satisfactory and not sufficiently representative. An update of this paper should, therefore, improve data quality particularly with regard to taxes.

In principle, we tried to create profiles for all revenue categories. For some revenues we were unable to create age-sex specific profiles due to the lack of appropriate data. By these missing, important items we mean e.g. the following: Labour Fund contributions, corporate income tax (CIT)¹², and the real estate tax.

For age-sex specific expenditures, the following data sources were used: ZUS upon request for old-age-pensions, disability pensions, sickness allowances and accident-at-work and occupational diseases' as well as maternity leave benefits; KRUS upon request for pensions, disability and survivors' benefits; source data used for AWG2009 report, stated also as a source data in our computations for civil servants (separately for the Ministry of Defence, Ministry of Internal Affairs, Ministry of Justice and Prison Services). Healthcare age specific expenditures were provided by the NFZ, but also household survey on healthcare expenditures (2006, CSO, rescaled to 2007) and the 2007 NFZ annual report were used as source data for computation of isolated micro-profiles. CSO reports on education (school year 2006/2007 and 2007/2008) were used to create primary, secondary and tertiary education profiles. Ministry of Labour and Social Affairs provided upon request data on unemployment benefits, though the quality and range were insufficient to create the satisfying profile. All 56 profiles are plotted in Appendix 2.

3.2.4. Growth and discount rates

According to own calculations based on CSO (2009) average growth of GDP per capita over the last 11 years (1998-2008) was around 1.9%¹³ while the average real long-term interest rate (measured by the ten-year Polish government bond - EDO) amounts to ca. 3.4%¹⁴. For reasons of comparison with the other countries assessed by the RCG¹⁵ we opt in our

¹¹ The amount net of EU flows covers also some part of the VAT paid by general government in relation to e.g. investment expenditures.

¹² For more insight into methodology see Auerbach and Chan (2003)

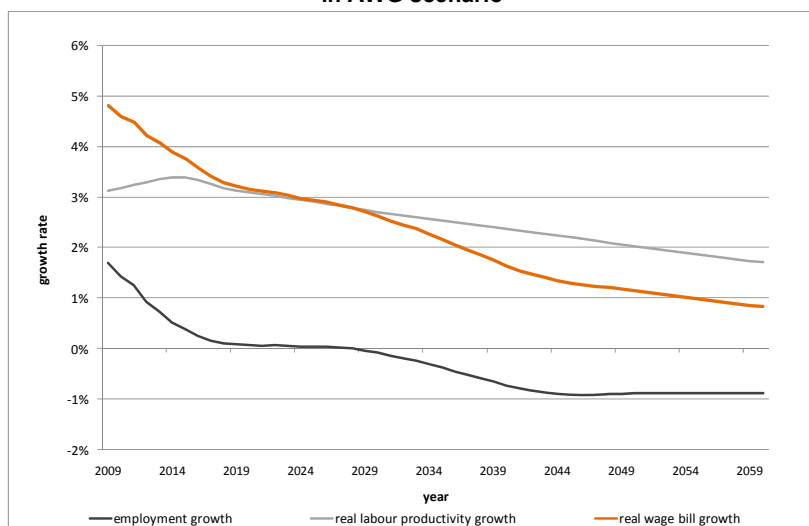
¹³ GDP per capita in Purchasing Power Standards (PPS)

¹⁴ As a reference we may use also the so called "technical rate" – the value used as a discounting rate for private insurance companies, set and updated temporarily by the insurance supervision. In 2009 it amounted to 3.33% in real terms.

¹⁵ For a large country comparison study of the RCG see e.g. Hagist et al. (2009) or Moog et al (2010).

standard setting for a growth rate of 1.5% and a discount rate of 3.0%. To produce comparable results with the AWG exercises we applied additionally the productivity and employment forecast of the AWG – which are illustrated in the following Figure 3:

Figure 3: Growth rates of employment, real wages, and the real wage bill in AWG scenario



Source: Own calculations

To cover the differences between the actual development and our standard scenario, a sensitivity analysis is undertaken in the appendix and discussed in one of the later sections. A detailed discussion on the choice of the discount and growth rate is given in the following chapter.

3.2.5. Limitations of the GA method¹⁶

Over the last 20 years GA has been a topic of recapitulating debate and criticism, pointing at the theoretical and empirical limitations and drawbacks of the concept. In this section we address firstly the theoretical objections with a brief overview of several demurs in the literature before we turn our attention to the empirical shortcomings and uncertainties. Reviews of GA can also be found in Cutler (1993), Haveman (1994) and Diamond (1996). Kotlikoff (1997) and Raffelhüschen (1999) summarize the critics and reply to several objections.

Theoretical Limitations

Theoretically, two major objections arise when applying GA. The first question is the validity of the underlying, neo-classical lifecycle hypothesis.¹⁷ The second criticizes the static framework of the concept and the associated incidence assumptions. According to neo-classical theory rational agents determine their lifecycle consumption path at the beginning of their planning horizon taking into account their available lifetime resources. Under the additional assumption of perfect capital markets lifetime resources equal the present value of summarized future income, which can be allocated over the remaining lifecycle by either borrowing or saving. Intergenerational policy will not affect the optimal consumption pattern

¹⁶ This chapter follows the elaborated discussion by our colleague Hagist (2008), pp.30-33 on the limitations of the GA method.

¹⁷ The lifecycle hypothesis goes back to Modigliani and Brumberg (1954, 1980).

as long as it does not affect the present value of post-tax future income. GA is putting on at this point with its measurement of remaining lifetime resources under current fiscal policy. If the planning horizon of individuals was shorter or longer than lifetime, conclusions on the ground of GAs could be misleading. One of the most extreme forms of thinking about this is the model of Ricardian Equivalence as posted by Barro (1974). This model, also known as the Barro-Ricardo equivalence proposition, assumes that families act as infinitely living dynasties due to intergenerational altruism. If this kind of altruism is thorough, fiscal policy which effects generations in the future will be offset by living generations through higher bequests. As a consequence there would be no need for such analysis as Generational Accounting or even debt quotas as in the Maastricht Treaty. However, empirical evidence does not suggest that people behave in the strong Ricardian sense.¹⁸ On the other hand, if individuals act myopically or are liquidity-constrained due to imperfect capital markets, the lifecycle postulation would overestimate the planning horizon and consumption would be based on current income.¹⁹ Evidence suggests that consumers really put more weight on current income than lifetime one. Whether this is due to myopic behavior or to credit-rationing is presently not fully understood.²⁰ However, as we see also nonmyopic behavior like volitional inheritance and voluntary long-term savings, pure myopic preferences seem as the Barro-Ricardo equivalence proposition a too strong assumption. The lifecycle model seems to be a good middle way between the myopic and Ricardian assumption and so GA delivers a fairly good approximation of intergenerational redistribution through fiscal policy. This also holds when considering the second theoretical objection, the underlying incidence assumptions. GA is a partial equilibrium analysis, neglecting the impacts of net tax burden on quantities and prices of consumption and saving, and the repercussions on factor inputs in the production process. To accurately assess tax or transfer incidence, only full specified dynamic general equilibrium models are sufficient. Three empirical studies have tested GA in this respect, i.e. to what extent the results of intergenerational redistribution as measured by GAs would change when considering the macroeconomic feedback effects. The evidence is again mixed. Fehr and Kotlikoff (1996) show that “in general changes in generational accounts provide fairly good approximations to generations’ actual changes in utility. The approximations are better for living generations. They are worse for policies that involve significant changes in the degree of tax progression and for economies with sizeable adjustment costs. Finally, GA needs to be adjusted in the case of small open economies to take into account the fact that the incidence of corporate taxation is likely to fall on labour. The method of adjustment is simply to allocate changes in corporate tax revenues to generations in proportion to their changes in labor supply. [...]” [Fehr and Kotlikoff 1996, 25]. Raffelhüschen and Risa (1997) on the other hand showed that an equalization of the intertemporal burden, as suggested by GA, might not be optimal in a welfare sense of view or time inconsistent depending on the selected discount rate. As a conclusion of these studies, it can be stated that Generational Accounting represents a superior alternative to annual cash flow budgets also in a theoretical framework. However, also GA like annual cash flow accounting has the common feature that it does not provide enough information to base welfare judgments on the outcome of the accounts alone.

Empirical Limitations

After considering the main theoretical objections, the empirical shortcomings are discussed in the following paragraphs. Firstly, the most central objection, is the use and selection of single growth and interest rates As stated in CBO (1995) “there is no uniquely right discount

¹⁸ The empirical evidence is at least mixed. See for example Mello, Kongsrud and Price (2004), Reitschuler and Cuaresma (2004) and Kotlikoff (2003).

¹⁹ See Buiter (1995) and Buiter and Kletzer (1995). For a model of myopic acting agents see Brown and Lewis (1981).

²⁰ See CBO (1995) and Hayashi (1985).

rate" [CBO 1995, 41]. A single discount rate combines the cost of waiting and the risks associated with the payment streams i.e. risky tax and transfer payments. Ideally the two categories should be divided. Furthermore the cost of waiting could be different for several generations.²¹ As a result a single discount rate will typically distort the outcome of GA. Furthermore the selection of the discount rate is rather arbitrary. Normally, GA uses a historical average of long-term government bonds. To induce a measurement of risk for net payments, some studies use not a historical average of long-term government bonds but of equity. Equally applicable would be to use the base year's rate of inflation-indexed bonds. These differ in some countries between the historical average of long-term government bonds.²² The same criticism applies for the growth or productivity rate. However, two arguments can degrade the criticism of these points to some degree. Firstly, only the spread between the interest and growth rate is relevant, at least approximately in the one digit area. With macro data, this relationship seems to be relatively stable over time as Fetzer (2006) has shown. Secondly, to determine the "right" growth-interest-spread sensitivity analysis in sensible areas can be used. Furthermore, indicators like the revenue or transfer gap are not very sensitive to variations in the growth-interest-spread. The second empirical shortcoming is the fixation of the age- and sex-specific profiles. For example, due to the demographic development, the female labour participation rate could rise and so a change of the relevant profiles would occur. Also the health related profiles could be a subject to change due to the medical-technical progress.²³ However, as, for example, Fetzer (2006) or Breyer and Felder (2006) have shown for the health sector, the constant profile assumption is a good approximation between different possible scenarios. However, as time series of age-specific data will be available in the next years, stochastic elements in the profiles could be introduced in future research. These stochastic elements could already be introduced in the next point under criticism, the deterministic population projection. As the demographics are the driving forces behind GA, the population projection is a particular point of relevance. Population projections are uncertain in two ways. Firstly, the expected parameters in the future like life expectancies or fertility rates are uncertain. Secondly, given certain assumptions about these parameters in the future, the path of development from base-year's values to expected values is also uncertain. Stochastic population projections could deal at least with the latter problem. Alho and Vanne (2006) and Hagist (2007) show that the indicators used by GA are sensitive to certain degrees to stochastic demographics. As far as the first problem is concerned, again sensitivity analysis is the only remedy. To take this point into account, we provide results for different population projections. The fourth empirical drawback is the base-year's budget. As the starting point of the analysis with Generational Accounts, it leads to results susceptible to possible distortion by business cycle effects. However, as Benz and Hagist (2007) have shown, the effects of the business cycle are relatively small.

Concluding this section, it can be said that GA has important limitations, which have to be kept in mind when interpreting the results. However, in some points these limitations apply to every kind of projecting or forecasting i.e. uncertainties about future parameters. Others are specific to GA. Overall, GAs should be less understood as a forecast but rather as a thought experiment. Surely, at some point in time, governments have to and will act and so change the results of the analysis. GA can therefore be considered only a highly unlikely "worst-case" scenario. Furthermore the method is highly valuable despite its limitations in comparing different reform proposals. Relative changes of GAs and the associated

²¹ For all these arguments see CBO (1995).

²² In the case of Germany, an inflation-indexed bond yields a return of about 1.4 per cent while the 30 years average return of a ten-year government bond is ca. 3.8 per cent as Fetzer (2006) has shown.

²³ See for example Felder (2006).

sustainability indicators – as illustrated in the following chapter are a reliable tool of measurement in evaluating the effects of certain reform proposals or changes in policy in every field of public finance.

4. The sustainability of the Polish fiscal system

This chapter presents the outcomes of our computations, starting from a sustainability analysis of separated domains of public finances, then taking a broader perspective on the entire general government. The analysis start from the NDC pensions, followed by the description of disability benefits and survivors' benefits paid from the general system. Thereafter we tackle the pension system for farmers and for civil servants followed by the healthcare system, with particular focus on the hospital treatment and long term care (LTC). Finally, we give a brief description of findings in the field of education.

4.1. Pensions paid by ZUS

4.1.1. Brief description of the NDC scheme

Polish old age provision in its current shape was founded in 1999, when the pension reform was introduced. It replaced the old-age-pension provision system, with defined benefit formula, with its large disproportion between paid contributions and pensions to be received, based on accumulation of contributory and non-contributory periods, selected from the individual job history. In the new mixed system based on individual funded and unfunded accounts the statutory retirement age remains unchanged: 60 years for women and 65 years for men. However, the possibility to retire earlier, easily accessible to many professions yet in the new system (e.g. miners, railway workers teachers, persons working in specific conditions), hampered the positive, self-stabilising effect of the new NDC rules. Early retirement was generally abolished in 2008. The two groups, which kept their early retirement privileges in an infinite time horizon are miners and teachers. For the other groups the so called 'bridging pension' system was installed to ease the process of the abolition of early retirement. The new system treats insured persons differently depending on their year of birth:

- For persons born before 31st December 1948 all paid contributions remained in the old system, so for them the pension is calculated using the old rules.
- Persons born between 1st January 1949 and 31st December 1968 could have chosen whether to stay only in the NDC system or enter the one with split contributions between NDC and FDC schemes. Despite their choice the 'initial capital' was computed to reflect the notional contributions virtually collected during the working life by persons with work experience before 1999. Initial capital was computed to translate the pre-reform working career to NDC contributions.
- All contributors born after 1st January 1969 are mandatorily covered by the new, shared NDC/FDC system.

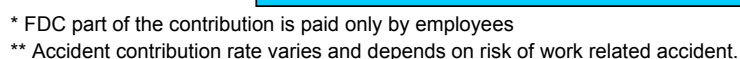
Since the pension reform of 1999 the Polish general pension system is based on a three pillar system, consisting of the following public and private schemes:

- **Ist pillar:** mandatory notional defined contribution scheme (NDC), where amounts of contributions are recorded on individual accounts, set for every insured person²⁴. The actual contributions are spent on current social benefits. The collected, "virtual" amounts are indexed annually with the floating interest rate, currently reflecting ZUS pension contributions fund growth. The sum of contributions collected over lifetime and indexed is divided upon retirement by the number of (expected) months of remaining life. Life expectancy tables are unisex, officially published and updated annually by the CSO.
- **IInd pillar:** mandatory funded defined contribution schemes, so called open pension funds (FDC), where around 60% of employee contributions from the Ist pillar is transferred and then invested.
- **IIIrd pillar:** consists of the following forms of private voluntary pension insurance funds: Employee pension programmes (PPE) created by individual employers, in the form of: 1)

²⁴ Farmers and e.g. uniformed services were excluded.

It is important to stress that the latter two pillars (IInd and IIIrd) are fully funded, so self-financing, and since they're not part of the general government according to ESA95, and SNA2008, we do not consider them in the calculations of the GA.

Figure 4: The Structure of Contribution rates in 2010



To prevent possible future liquidity constraints in NDC pension payments, a buffer fund (Demographic Reserve Fund) was created. Up to now its assets are not very significant, consisting mainly of government bonds. Presently (2010) this fund amounts to less than 5% of the annual ZUS pension expenditures. In the case of default of the NDC, the state budget guarantees the payment of social benefits. The first use of the FRD sources to support the

pension fund is expected in 2010 in the amount of 7.5bn²⁵. We reflect this relatively small amount as decreasing in real terms of the explicit debt of isolated ZUS pension scheme and the whole general government discounted to the base year.

Apart from these assets of the FRD the mismatch of contributions and expenditures of FUS can and has been financed by additional support from the state budget. In recent years the deficit of FUS covered by state budget transfers and to some extent by loans was considerable. In the base year the amount of additional support from the state budget amounted to over 30% of NDC's total revenues. A number of factors influenced the growing deficit of FUS namely: a relatively short effective working period resulting from early retirement possibility, the ceiling on social contributions, the outflow of significant portion of employee contributions to FDC, the lack of contributions for persons on maternity leave, parental leave, and handicapped persons and the liquidation of the so called "old portfolio" (increase in the lowest pensions) for older pensioners.

4.1.2. Computation procedure for NDC pensions

The computation of the relatively complex transformation of the Polish pension system, described above, imposes certain challenges. If we decided to apply the standard GA approach, based on continuous development of today's profile of pension expenditures into the future, with an adjustment for growth, we would actually project the old system into the future, since pensions paid in the base year are paid only for persons who retire under the regime of the old system. It would then be an obvious mistake – in such a scenario we would show the consequences of a lack of the 1999 reform! Instead, we need to show the walking changeover from this old system anchored in the base year profile, to a mixed system of higher (19.52%) and lower (12.22%) contributions collected for persons born between 1949 and 1969 arriving at the system where all contributions are based on a flat profile (at a level of 12.22%). By the explicit term 'walking' we mean that each next year of the forecast there will be one cohort less from the old system, and one cohort more from the new system. As a consequence, in several decades all contributors shall pay 12.22% and receive their NDC pension based on this lowered percentages of pension contributions. In order to forecast future pension expenditures one has to develop the forecast on the basis of expected progress of average account levels for each cohort, weighted with numerous probabilities. Then we will describe our computation procedure in greater detail. The NDC pensions are calculated in a few steps, starting from the age/gender specific gross income²⁶ per 1-year cohort, adjusted for the probability to be a member of the working population, as depicted in Figure 5:

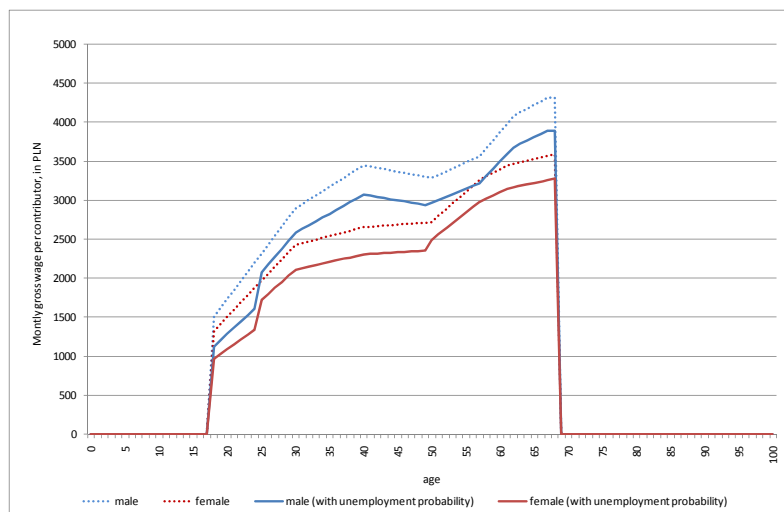
Here we would only like to stress that we derive an *expected* wage profile. Hereby we take into account that contributors show certain age and gender specific probabilities to be unemployed. Therefore, the expected wage profile is lower than the average income of an average employee – see Figure 6²⁷. This reflects the fact that the state is paying social contributions for unemployed persons, which, in consequence, lowers the gross income per capita. The state pays the contributions for unemployed persons during the period when they're allowed to receive the unemployment benefit. In our projection we assume that this probability will remain constant over time.

The next step in our procedure reflects the probability to be either a NDC or a NDC/FDC member. The probability was based on the information on the number of age/gender specific FDC accounts, as of 2009. Only registered and verified accounts were taken into consideration for persons born between 1949 and 1969:

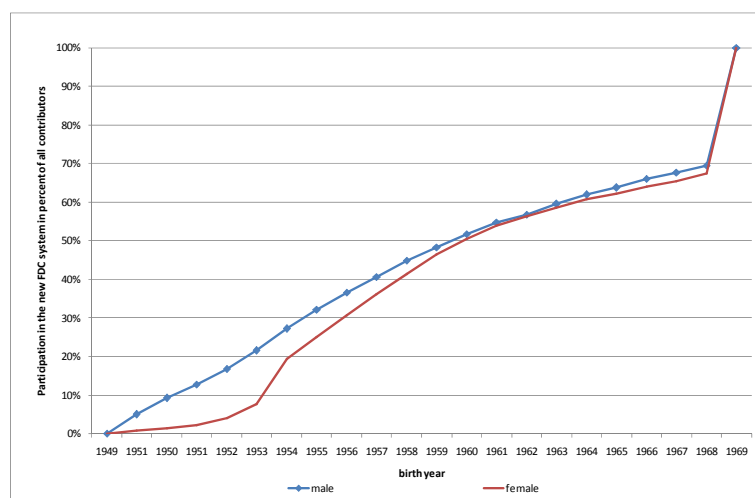
²⁵ Further imputation of remaining resources of the FRD seems disputable, e.g. apart from around 10.5 bn of assets at the end of 2009, the fund recorded also liabilities of 4.4 bn.

²⁶ Structure of wages and salaries by occupations in October 2006 (CSO, 2007).

²⁷ Age and gender specific unemployment probabilities are derived on the basis of Eurostat. We apply a 10 year average of the years 1999 to 2008.

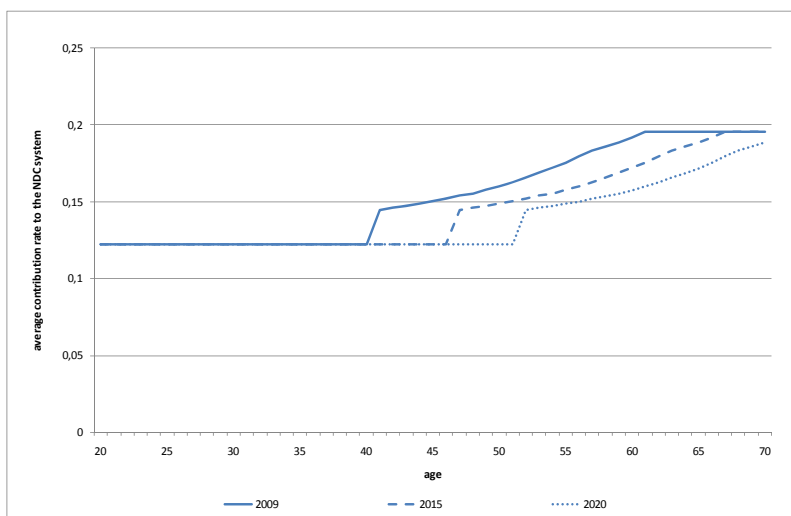
Figure 5: Monthly average gross income in Poland, age brackets 17-68, in 2008

Source: own calculations.

Figure 6: Probability to be an FDC participant in 2009

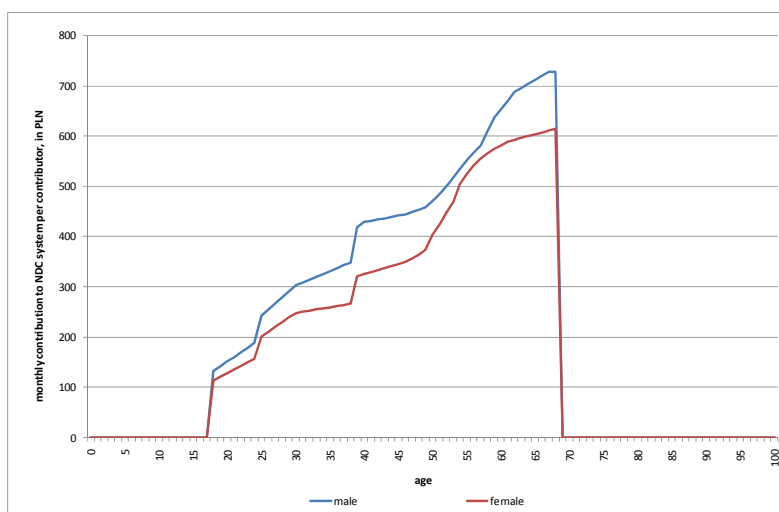
Source: own calculations based on data provided by ZUS

For all persons born before 1949 the pension expenditure and contribution profiles of the base year are applied. Their probability to be a member of the NDC and FDC system is zero. For persons born in 1969 and later we assumed 100% probability to enter the NDC/FDC scheme. Each year of the forecast following the base year the probability is adjusted to a *walking profile*, i.e. in 2015, comparing to 2007, eight more cohorts will pay 12.22% of pension contributions, so eight less cohorts will pay 19.52% and so on. In this way we compute the cohort specific contribution rates.

Figure 7: NDC contribution rates

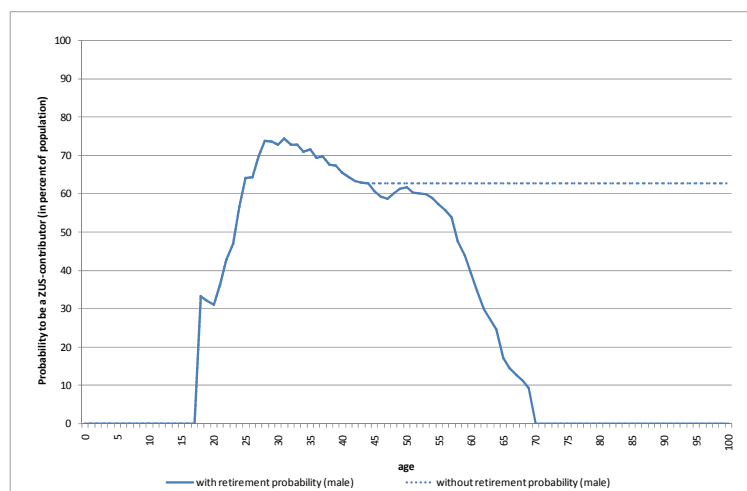
Source: own calculations

Furthermore, after the application of cohort specific contribution rates to gross salary we receive contributions per contributor – see Figure 8.

Figure 8: monthly NDC contributions per contributor

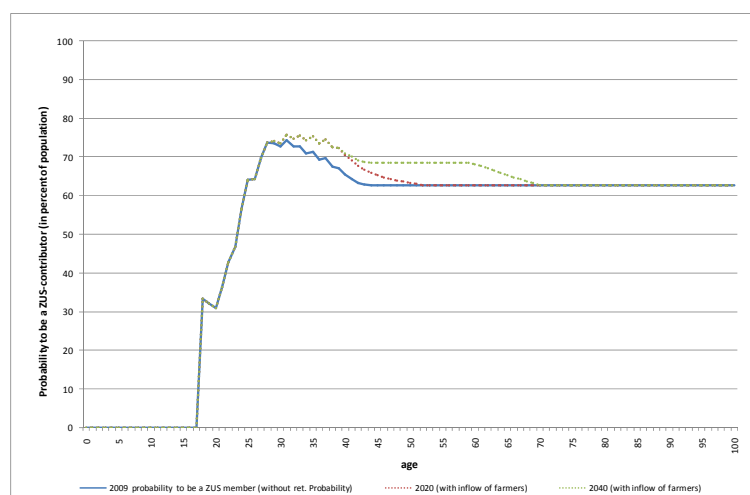
Source: own calculations.

In the next step age/gender specific contributions are weighted with the probability to be a NDC contributor. We derive this value examining the ratio of contributors to the overall population size in each cohort and for both sexes. This ratio amounts to around 60% for persons aged over 60 in the base year. For younger cohorts it reaches a level of around 73%. We assume that the participation in the NDC system is constant over time and we keep the (age-specific) probability to contribute to the NDC system as they increase from 60% to 73%. Of course, the probability to be a contributor is affected not only by age and gender specific employment rates but also by retirement probability. In order to model the change of future retirement behaviour – due to e.g. the increase of legal retirement ages and the abolishment of early retirement schemes – we separate the influence of retirement decisions in our computation. Therefore, we keep the probability to be a contributor constant at a level of 63% for cohorts aged 45 and older (see Figure 9).

Figure 9: Probability to contribute to NDC, male

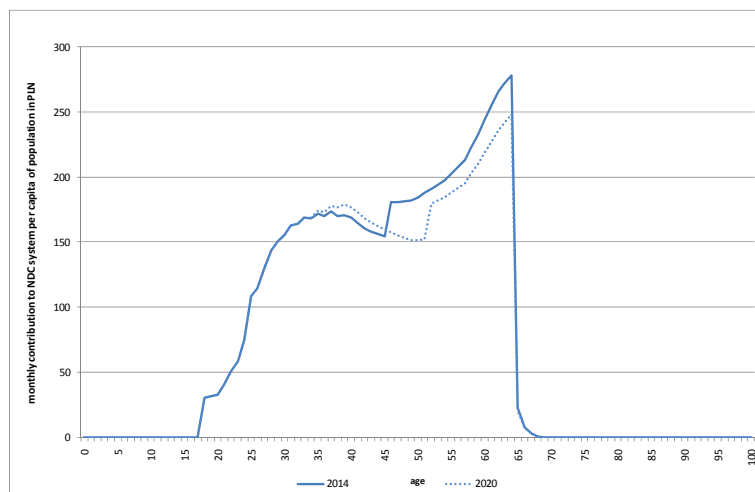
Source: own calculations

At this stage one important extension is introduced: an inflow of contributors due to the future transformation of the farming sector. In our standard scenario we reflect that the farming sector will shrink in the coming decades reaching the EU average in 2060. This outflow from KRUS is accompanied with respectively equal inflow into ZUS. The corresponding probability to switch the insurance system from KRUS to NDC is described in more details in chapter devoted to farmers' social insurance. As plotted in Figure 10, an inflow of individuals who decided not to enter the farming sector has considerable influence on the probability to participate in the NDC system.

Figure 10: Probability to switch from KRUS to NDC, male

Source: own calculations

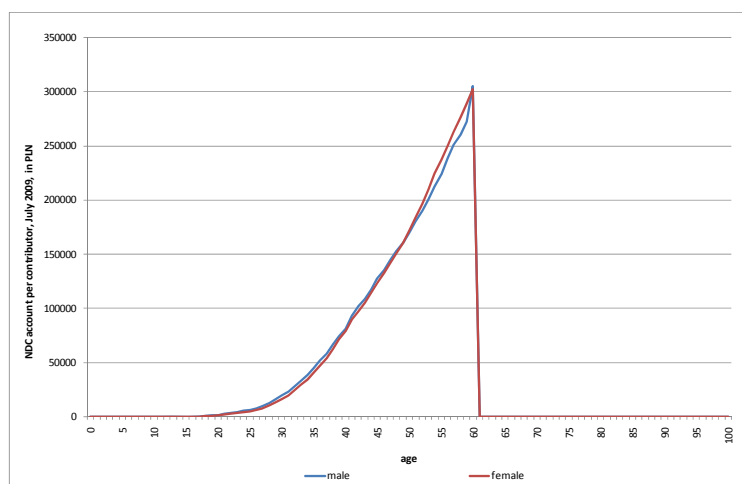
With the given probability to be a NDC contributor we finally receive the contributions per capita of population – see Figure 11. This micro approach chosen to reflect especially the phasing in of the 1999 pension reform is relatively complex. In order to guarantee, nevertheless, a match with actual aggregate data we finally rescale the computed contributions to the sum of actual contributions in 2009.

Figure 11: NDC contributions per capita of population

Source: own calculations

The dotted line in Figure 11 is a sign of the 'walking profile' over the years – clearly showing that in 2020 a bigger number of contributors will be paying lowered contributions.²⁸ Here it becomes already obvious that in the coming years individual pension contributions will be lower than today which will be a challenge for the (medium term) financing of the pension system. In this context one also has to bear in mind that these lowered contributions have to finance relatively high pension entitlements of present pensioners. We will come back later to this issue when analyzing the future development of ZUS expenditures. Figure 11 also shows the impact of the inflow from the farming sector, especially for the age groups 35 to 45. Nevertheless, these additional contribution payers can only partially counteract the effects of the lowering of contribution rates.

Since the contributions paid in the base year are not recorded from the "zero" level, then to reflect the expected pensions in the future we shall reflect the history of accumulation of the contributions and the initial capital on the NDC. On the basis of information provided by ZUS on the levels of NDC accounts for each cohort in the base year we may start up to forecast the expected future levels.

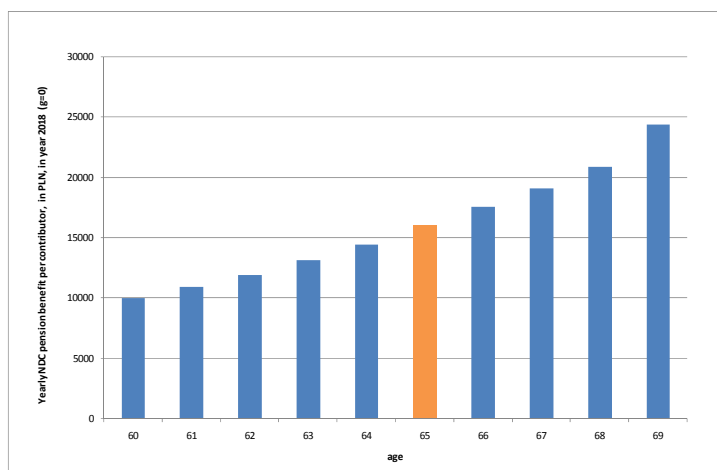
Figure 12: NDC accounts per contributor

Source: own calculations

²⁸ It should be noted that for the purposes of illustration wage growth effects are not taken into account in Figure 11.

The expected accumulation of contributions by each cohort is increased additionally by the legally required indexation of the accounts, equal to the growth of the aggregated contributions. This wage bill growth is based on the future productivity and employment growth.²⁹ As shown in Figure 13, longer working period contributes significantly to the higher expected pension level upon retirement.

Figure 13: Pension level per capita of male contributor, in PLN, in 2018, $g=0\%$

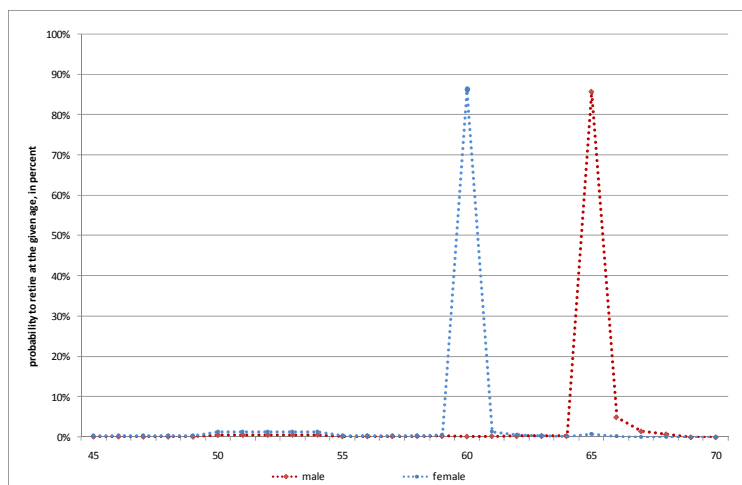


Source: own calculations

After the year 2009 for women, and 2014 for men, all new pensioners are obliged by the rules of the new system to retire not sooner than at the age of 60 and 65, respectively. Therefore, we derive these future retirement probabilities on the basis of present (2007) retirement probabilities. This is simply done by summing up all probabilities before 60/65. An occupation group, which can retire earlier than the statutory retirement age are teachers. Of course, also bridge pensioners and miners pensioners can retire earlier, but they are treated separately – see following chapters. A considerable number of teachers enter the pension system at the age of 50 to 54. This explains the slight increase for these age groups in Figure 14. In accordance with the assumption of the invariant retirement behaviour over time the probabilities to retire after statutory retirement age remain unchanged in the future, though they are limited to the age of 68. For every year the retirement probabilities sum up to one.

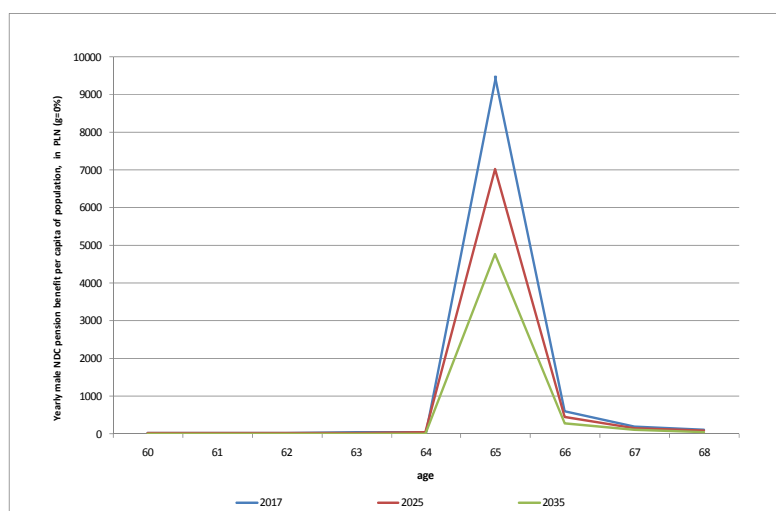
The resulting pension benefits per capita of the population are outlined in Figure 15. It shows pensions dropping per capita in the coming decades, which is a strict consequence of *phasing-out* of the pension system. The very low per capita pension level for persons retiring later than at the statutory age should not be interpreted as a per capita cost of each new pensioner – the low amount of the benefit reflects the assumed low probability value to retire after statutory age, not the low benefit level per contributor.

²⁹ Our presumptions on future employment growth are illustrated in chapter devoted to assumptions and data. The productivity growth equals the chosen value of 1,5% in real terms.

Figure 14: Probability to retire in the new system

Source: own calculations

4

Figure 15: Change of the expected pension benefit per capita of population, in PLN

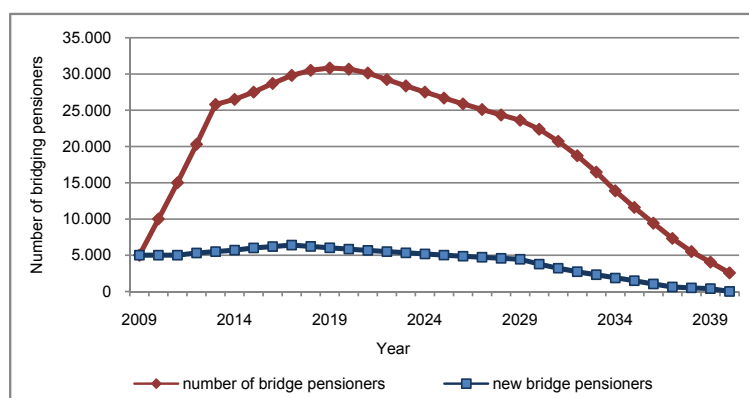
Source: own calculations

Due to the different legal rules set for different professions in the Polish pension system the above described procedure requires a few corrections in probabilities and at the level of aggregated contributions and pension expenditures. Corrections have been introduced for two groups of persons: early pensioners entitled during the transition period to early retirement, and miners, who kept their early retirement privileges without a time limit.

4.1.2.1. Computation procedure for bridging pensions

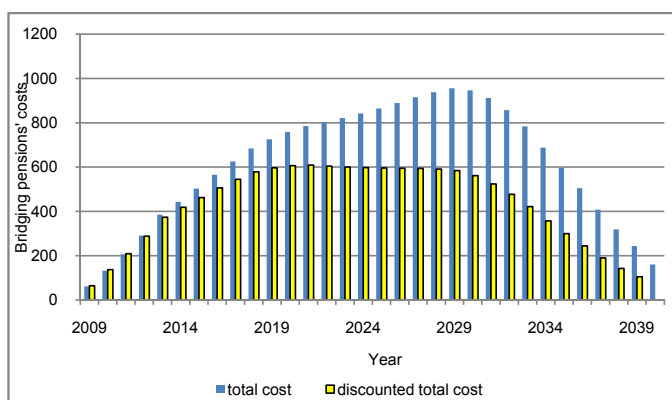
This group consists of persons working in specific conditions³⁰, who are paid the so called bridging pensions, received in principle for 5 (or 10) years between the early retirement at the age of 55/60 for women/men, and statutory retirement age of 60/65. Due to the expected very small number of 10 year-long bridging pensions, and related 10 year long specific probabilities, we assumed that all bridging pensions will be paid for 5 years. The bridging pension act, which came into force in 2008, limited significantly the possibility to retire earlier for the vast majority of persons. In consequence, after 2008, only a narrow, selected group of professions will be allowed to retire earlier for some time in the future. To reflect the bridging pensions in our calculations the assumptions of the background document attached to the bridging pension act was used, or more precisely, its description of expected economic effects of bridging pensions in the future, as presented in Figure 16 and Figure 17:

Figure 16: Expected number of bridging pensioners



Source: own calculations

Figure 17: Expected bridging pension costs, discounted and not discounted, in real terms of 2007, in million PLN



Source: own calculations

³⁰ In practice it means work in conditions harmful for the health of the employee.

The calculation of the missing data of the expected bridging pensions' costs was based on the following assumptions:

- According to the information provided in the above-mentioned reports more than 90% of railway workers retires 5 years³¹ before the statutory retirement age.
- Provided the already mentioned assumption of time-invariant retirement behaviour, we assume that railway workers retirement behaviour is representative for all current and future bridging pensioners.
- The inflow of new pensioners grows at the decreasing pace until 2017 and then starts to drop at the average pace of 10% per year, each year until 2040, when it falls to zero.
- The total number of bridging pensioners changes in accordance with the pace of inflow, as described above. Additionally, it is gradually reduced when after 5 years the bridging pension 'transforms' into standard pension paid from the statutory NDC account. In consequence, the same number of pensioners, which inflows in year t is subtracted in $t+5$.
- Every bridging pensioner who leaves the bridging pension system "automatically" increases the probabilities to retire at the statutory age of 60/65 in the old-age pension system. In other words: the outflow from the bridging pension system equals the inflow to the NDC pension system 5 years later.
- The average bridging pension was estimated by dividing the expected overall annual bridging pensions' costs (not discounted) by the number of bridging pensioners.
- Bridging Pensions Fund, settled to ease the bridging pension costs burden imposed on the taxpayers shall collect contributions amounting to 1.5% of salaries in enterprises hiring persons who work in harmful conditions: we estimate that the pace of inflow of contributions shall decrease over the years at a pace of around 96% every year³².

Initially, teachers' work was not regarded by law as particularly harmful for health, so they are not included in the bridging pension system. After the introduction of the legal act on special compensations for teachers in 2009, they in principle kept a part of the privileges from the past system. According to new rules, teachers who prove required 30 or 20 years of contributory periods upon retirement in years 2009 – 2014 may retire at the age of 55(w)/60(m). In the coming years the retirement age will be gradually increased until 59/64 in years 2031-2032. In our assumptions based on the analysis of teachers' retirement behaviour³³ we assume an accumulation of the probabilities to retire from previous years at an age that is relevant for the above-mentioned periods. In other words, we assume a gradual unification of retirement age for teachers with the NDC system until 2032. Due to the lack of available information on gender specific structure for this profession we assumed that it consists in 2/3 of women and 1/3 of men, with the flat probability profile to be a teacher in all cohorts of the working population. The teachers' compensational pensions will be paid from the ZUS pension fund, so we modify the probability to retire at a certain age in the ZUS pension system accordingly.

³¹ <http://www.zus.pl/files/kolejowe2007.pdf>, available in June 2010. Actually, the computations of retirement behavior probabilities were based on the averages for the (available) years: 2004-2008.

³² These assumptions have very minor impact on the sustainability analyses of the pension system: average annual inflow of contributions to the Bridge Pension Fund shall amount to around 35 m, comparing to e.g. 1 bn of expenditures on bridge pensions around year 2030. According to preliminary data for 2009, the bridge pension costs are smaller than our estimates, so their expected impact in the future should be smaller, also in comparison to estimates assumed in the bridge pension act.

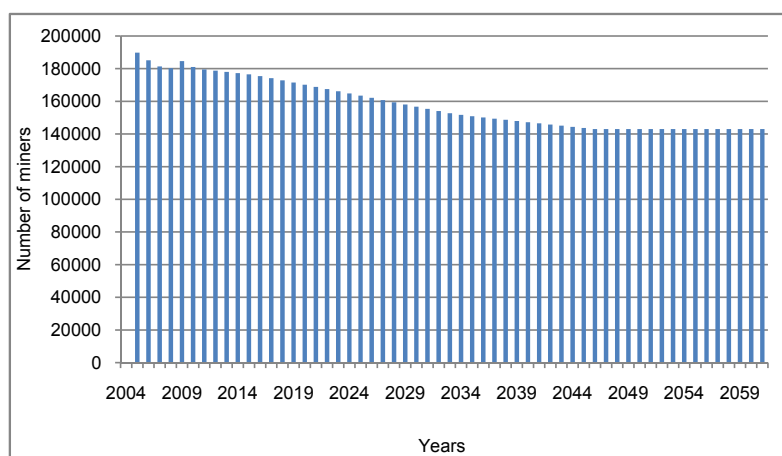
³³ <http://www.zus.pl/default.asp?p=5&id=491>, reports on social benefits for teachers, ZUS, years 2004-2008.

4.1.2.2. Computation procedure for miners' pensions

A profession, which profits from the early retirement privileges in an infinite time horizon is mining. Legal rules set for this group in 2005 petrify the old system rules, where a pension was based on contributory and non-contributory periods. Additionally, a significant factor contributing to miners' pension levels, is a relatively high average "pension calculation basis"³⁴, directly related to the so called multiplier coefficient (every year of working carrier multiplies in principle by 1.8) and to some extent to high miners' salaries.

Since miners' pensions are based on old rules, different from standard NDC system's provisions, their contributions increase the overall sum of ZUS pension contributions, but are not registered on the NDC accounts. In consequence, the sum of contributions collected on the NDC accounts are lower than the actual overall amount of pension contributions in the base year. In seeking for more precise outcomes we excluded the miners' pension system from available data and computed them separately. The isolation process starts with the estimation of the expected number of miners. This forecast was based on a combined analysis of some variables published annually by ZUS for particular occupations, including miners: the number of miners³⁵, miners' retirement behaviour in years 2004-2008³⁶ and the number of miner pensioners in these years³⁷. According to our assumptions, the number of miners will gradually drop to around 140,000 in 2040. However, this figure was estimated on the basis of a statistical trend, which can make our assumptions controversial. Nevertheless, if the number of contributors in mining was dropping faster or below our assumptions, then the revenue side of virtual miners' pension scheme could be even more undermined.

Figure 18: Projected number of miners



Source: own calculations

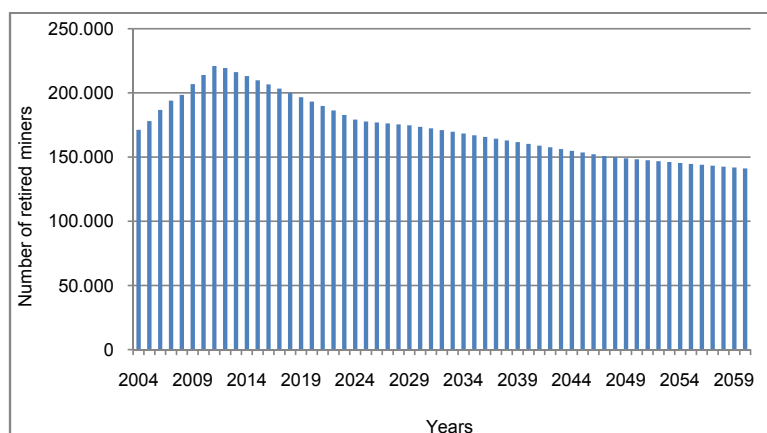
If we assume again a constant retirement behaviour in the case when undoubtedly generous benefits are continued to be granted to miners, the results are as follows: 60% out of today's ca. 180,300 miners shall retire after 25 years of work, and another 35% after 30 years. With the given number of miners-pensioners (around 200,000), which grows exponentially, we assume that the trend shall reverse in the coming years and put the number of miners-pensioners at level of around 180,000 in years 2033-2038. Therefore, between base year 200,000 pensioners and 180,000 pensioners expected in 25-30 years we 'draw' a curve, which is our proxy for the estimated number of miners' pensioners in the future.

³⁴ PLN 3831.08 for miners, and PLN 1923.28 for average ZUS member.

³⁵ According to Employment in national economy (CSO, 2007) there are around 180.3 thousands of miners. Available data cover period 2004-2008.

³⁶ <http://www.zus.pl/files/gornicze2007.pdf>

³⁷ *Ibidem*

Figure 19: Projected number of retired miners

Source: own calculations

In the next step we estimate the average miner pension contributions, which are based on the average miner's gross salary³⁸ treated with the time-invariant nominal pension contribution rate 19.52%. With the given number of miners in the economy, this simple method will provide us with the annual pension contributions paid by (and for) miners. Miners' salaries grow with our standard annual growth rate g of 1.5% in real terms. The miners' pension profile, based on the data provided upon request by ZUS, is rescaled to the level of average pensions that are indexed with $0.2 \cdot g$ until 2060. The probability to be a miner remains unchanged in the future and is flat for male working cohorts aged from 20 to 45; to reflect the probability of retiring it starts to drop to reach zero at the age of 69.

4.1.2.3. Computation procedure for minimum pensions

Some corrections to compute levels of future NDC pensions are particularly difficult to predict, and one of them is the expected burden on the NDC pension system resulting from the minimum pensions. In the new system the difference between expected pension and minimum pension level is paid to a person who meets two conditions:

- his/her overall amount of collected and indexed NDC and FDC contributions divided by life expectancy must be insufficient to satisfy minimum pension,
- such person should prove at least a 20 (women) or 25 (men) year working period.

The analysis of the working period of ZUS average new pensioners suggests that the latter condition is satisfied in over 90% of cases, and the overall cost came to around 2.3 bn in 2008. Knowing the age and gender specific profile of minimum pension in the base year we assume that it will remain constant in the future. This implies that the probability to receive a minimum pension stays constant over time. Of course, such a simplified approach can be criticized. The new (NDC) pension formula leads to a cut of yearly pension entitlements – in comparison to the pension system before the 1999 reform. It could therefore result in an increase of the probability to receive a minimum pension. However, this effect might be counteracted by a longer working period.³⁹ Future research should analyze these two factors and their impact on the future development on minimum pensions.

It is important to stress also other consequences of single income levels per cohort: we neglect the variable structure of salaries between groups of employees who are the same age. For instance, for self-employed persons, whose salaries are relatively high comparing to

³⁸ PLN 5,463 according to the Structure of wages and salaries by the occupation (CSO, 2007).

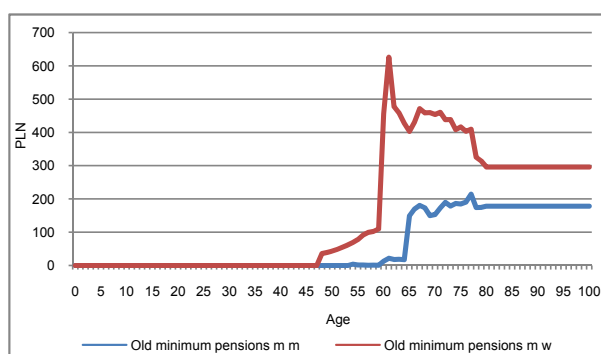
³⁹ For an examination of the adequacy of future pension levels see Leifels et al. (2010).

economy average, the basis of the pension contributions is declared by law at level of the minimum income, stipulated by law to constitute 60% of the minimum salary in 2008⁴⁰. In consequence, for this group of persons the salaries are high, but the contributions paid to the NDC scheme are much smaller. Since we include their salaries in the average for all cohorts, for which we apply the nominal pension contributions' rates, we most probably overestimate the inflow of contributions from the high-income self-employed entrepreneurs.⁴¹

Indexation is a further crucial issue for the projection of minimum pension expenditures. So far minimum pensions are adjusted annually to 20% of the salaries' growth in the economy. In the long run this rule would lead to an "extinction" of the minimum pension. This is caused by the growth differential between pension entitlements (before retirement) – which grow with the wage bill growth⁴² – and the minimum pension. As a consequence, fewer future pensioners will fall under the threshold of the minimum pension which will lead to a future decrease of minimum pension expenditures (measured in % of GDP). However, it is highly debatable whether a perpetuation of the low minimum pension indexation is politically realistic. When we put together all the above-mentioned issues related to the minimum pension, we may formulate initial conclusions in reference to the minimum pension issue:

- when analyzing the current average working period for ZUS members, almost everyone will meet the working period criterion for compensation to minimum pension, if NDC/FDC contributions prove insufficient to qualify for such a pension;
- the application of the flat income profile, stemming from modest available data source on income distribution in the economy, results in a lack of separated pension contribution profiles for the self-employed insured in NDC, who pay lower than average contributions, which may be a reason to become a 'minimum pensioner';
- results of our computations do not show threats of high budgetary compensations to minimum pension level, in case the minimum pension indexation remained on the level of 20% of the wage' growth.

Figure 20: Expected minimum pension costs in real terms of 2007, per capita, PLN



Source: own calculations on the basis of data provided by ZUS

⁴⁰ Actually amounting to 53% in 2008 (Social Insurance in Poland, ZUS, 2009).

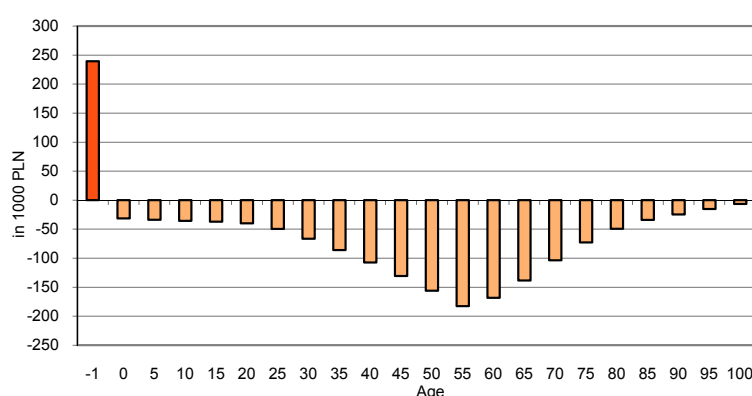
⁴¹ As described before we use the average salary of employees in Poland as a basis for the calculation of contributions. So far we are not differentiating between self-employed persons and employees, which clearly could lead to a considerable degree of inaccuracy. However, we overcome this limitation to great extent by rescaling our computed contribution data to actual aggregated contributions in 2009. Still, our pension model could be further improved by a distinction between different employee groups.

⁴² Even when considering negative employment growth (AWG assumptions) in the coming decades the annual adjustment of pension entitlements (before retirement), i.e. of NDC accounts, is still expected to be higher than the indexation of minimum pensions.

4.1.2.4. Generational Accounts for the ZUS pension fund

As illustrated in chapter 3 the general old-age-pension system (ZUS) underwent profound reforms in recent years. The reform of 1999, which inter alia introduced the present NDC system, represents a milestone. The following chapter aims to address the question to what extent the current design of ZUS is prepared for the future demographic challenges. Was the 1999 pension reform appropriate to ensure the sustainability of the ZUS pension fund? Currently new reforms are debated. Besides a modification of female retirement ages also a partial abolishment of the 1999 reform is presently discussed. Are these new reforms required? The following chapter shall also address this question. But first we shall take a closer look at the profound pension reform of 1999.

Figure 21: Generational accounting and FGB of ZUS pensions - no 1999 reform, 2007, $r=3\%$, $g=1.5\%$



Source: own calculations

Where are we coming from? Figure 21 shows generational accounts for pensions and contributions paid by ZUS in a no-1999-reform-scenario. It is straightforward that this old pension system would not have been sustainable in the long term⁴³: All cohorts (aged 0 to 100) are net-beneficiaries, i.e. they obtain more ZUS-benefits than they pay ZUS-contributions over their remaining life-cycle (in present value). Of course this no-1999-reform scenario suggests a big threat for future newborns since eventually somebody has to pay the bill, the annual deficits. Next we carry out a thought experiment that all arising debts have to be closed by future generations. The resulting burden for future cohorts is illustrated by the generational account of a *-1 year old*, i.e. a person born one year after the base year. A representative of this generation would have to pay net ca. PLN 240,000 over his/her remaining life-cycle. In other words he/she would be considerably worse off than a *0 year old* – by about PLN 270,000. This represents considerable intergenerational redistribution.

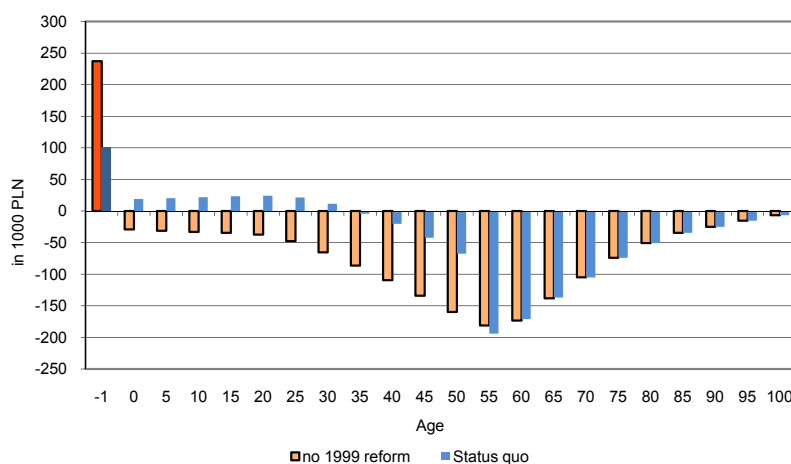
Coming to the first conclusion, the old pension system imposed large fiscal burdens on future generations and was clearly not sustainable.

Where did we go? As outlined in chapter 4.1 the pension reform of 1999 marked a remarkable change of paradigm for the Polish old age provision. Not only NDC accounts have been implemented but also parts of the former PAYG contributions have been shifted to funded schemes (FDC). Overall, this reform package considerably improved the long-term stability of the ZUS pension fund – as outlined in Figure 22. The burden on future generations – shown on the example of a *-1 year old* – diminished by about PLN150,000.

The interesting question is also how present generations are affected by the reform of 1999. As shown in Figure 22 for persons already retired, aged 60 and over, the reform has no

⁴³ This is even more remarkable considering that the old system had a much “stronger” revenue basis. Every contributor paid his/her entire contributions, presently 19.52 %, to the PAYG system.

Figure 22: Generational accounting of ZUS pensions – status quo and no 1999 reform, 2007, $r=3\%$, $g=1.5\%$



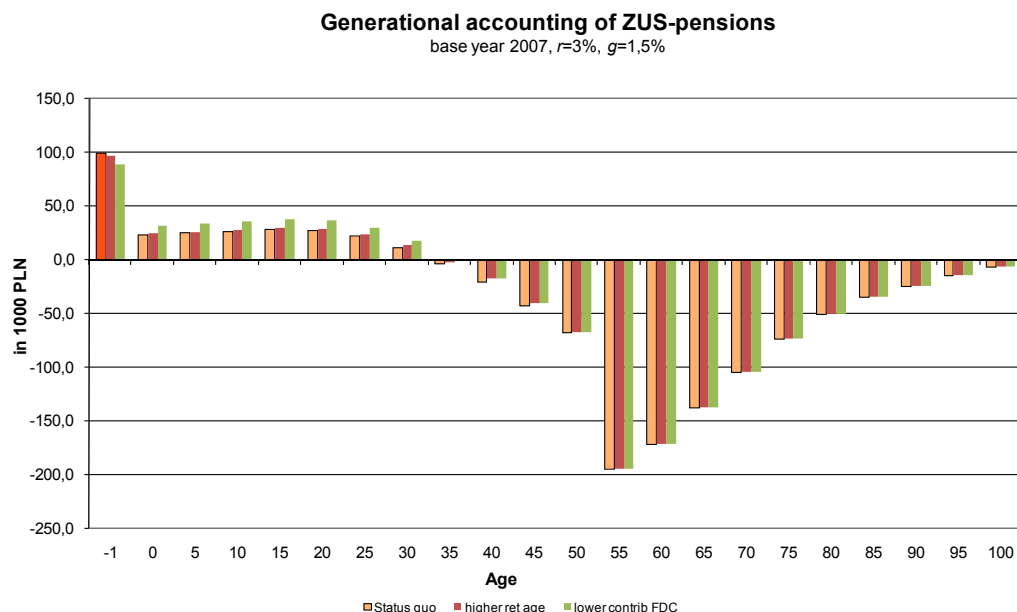
Source: own calculations

effect, since all of them retired upon rules of the old system. The impact of the reform can be spotted, however, for persons born after 1948. The reform has clearly a larger impact on younger cohorts aged 50 and below. The main reason for this difference of intergenerational burdens lies in the calculation of initial capital. Older persons (aged 50+) – who have relatively long contribution histories before 1999 – could benefit to a larger extent from generous rules for the calculation of their initial capital. Next, the effect of the 1999 reform shall be illustrated taking as an example the cohorts aged 50 (in the base year). In the no-1999-reform scenario these cohorts would receive net PLN 160,000 over their remaining life-cycle from ZUS – illustrated in the respective generational account in Figure 22. In other words they are net-beneficiaries. However, in this context it is important to stress once again that only future cash flows are considered here. After the 1999 reform these cohorts are still net-beneficiaries of the system but the generational account amounts only to about PLN 70,000, instead of PLN 160,000, i.e. these cohorts receive net PLN 90,000 less due to the reform. Also for younger the cohorts a considerable twist occurs. All cohorts starting from current newborns until the age of 35 are expected to be net payers to the system.

Coming to the second conclusion, the 1999 reform considerably increased the long term stability of the ZUS pension fund. The cohorts affected by this reform are born after 1948.

Where could we go? Figure 23 shows the expected impact on GA of recently discussed reform proposals: the extension of working period for women from 60 to 65, and cut off in the FDC share of the contribution. The scenario for women assumes a gradual lengthening of the contribution period, starting from 2026 until 2035. Each year a female worker would have to work half a year longer – in consequence the working period is extended by five years within a ten year transition period. For the FDC cut we assumed the recently discussed proposal of a decrease from the current 7.3% to 3% of the pension contribution, to be transferred to the FDC. In other words, a larger part of agents' pension contributions stays in ZUS, which means that pension entitlements recorded on individual accounts increase according to vesting formulas. The assumptions on isolation remain unchanged.

The picture of GAs remains almost unchanged for the consequences of the longer working period of women, for all living cohorts. The reason is straightforward: Due to the (relatively) neutral actuarial design of the NDC pension system the longer contribution periods of women (until 65) are equalized by increased pension levels. In net and present value terms,

Figure 23: Generational Accounts and FGB – new reform proposals, $r=3.0$, $g=1.5$, 2007

Source: own calculations

therefore, GAs remain almost constant. The same argumentation counts for the FDC cut reform. Also here it has to be made clear that higher contributions to the NDC system result in increased retirement incomes in the future. Nevertheless, it is interesting that the impact of the FDC cut reform is more visible than considering a scenario with higher female retirement ages. One explanation lies in the applied concept of calculating GAs in present value terms. With this approach present payments – in case of the FDC cut reform: higher present contributions – are discounted less than future payments – in case of the FDC cut reform: higher future pensions.⁴⁴ As a consequence, the GAs turn out to be slightly higher for this latter reform scenario. Of course, mainly younger cohorts are affected by a cut of FDC contributions since they participate fully in the NDC/FDC system.

Comparing to no-1999-reform scenario we conclude that the factor which played the foremost role in the 1999 pension reform with respect to sustainability measured by the GA, was the introduction of the individual pension account for each contributor. To give an explanation for this argument one has to take a closer look at the NDC benefit formula. In comparison to the old defined benefit system before the 1999 reform, the NDC system automatically adjusts pension benefits to the future demographic development. The indexation of the NDC accounts in accordance with the wage bill growth is one example here. Additionally, the consideration of increasing (unisex) life expectancies in the (NDC) benefit formula results in a more sustainable pension system. The individual pension accounts also clearly lead to a direct linkage between contributions and benefits in the Polish pension system. Therefore, in the case of lowered contributions to be transferred to FDC the impact on sustainability is marginal. Higher contributions simply translate into higher pension levels.⁴⁵ To put it simple: the financing of the current ZUS pension fund cannot be regarded

⁴⁴ In other words the timing of revenues and expenditures is crucial for the slightly higher impact of the FDC cut reform. This issue will be outlined in further detail in the following chapter 4.1.2.5 on cash flows

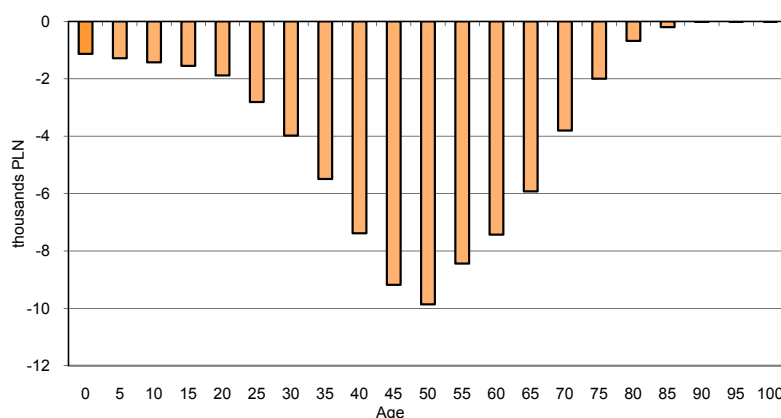
⁴⁵ Of course, these increased contributions with a significant time lag result in higher pension levels. In our computations – calculating in present value terms – fiscal flows in a more distant future are highly discounted. Therefore, an increase of present contributions – which is accompanied by an increase of pension levels in a more distant future – leads to slightly better sustainability results.

as very problematic in the (very) long term (see box 1). As a consequence, taking a long term perspective with the assessment of sustainability any downscaling of this (relatively) sustainable system does not make it significantly more or less sustainable. However, it is important to stress that in the coming 30 years the system is faced with a substantial challenge to bear the so called “double burden”⁴⁶. We will outline this later in chapter 4.1.2.5. In the case of a longer working period imposed on women, the consequences are the same as for any other worker, irrespectively of gender and age: if one works longer/shorter, he/she accumulates higher/lower entitlements. The interpretation of this reform step is similar to a cut of FDC contributions: higher female retirement ages represent an extension of the (relatively sustainable) NDC system. The long-term balance of contributions and expenditures is almost unaffected. Nevertheless, at this point it should be already noted that the timing and the extent of annual cash flows is considerably affected by both reform proposals. This will be outlined in the following chapter 4.1.2.5 on cash flows.

Coming to the third conclusion: the increase in female retirement age shows only marginal impact on the fiscal long term stability. The FDC reform would have a more apparent but still limited influence on the fiscal sustainability. It is limited due to the fact that the huge additional inflow of contributions in initial stage of the reform is accompanied by increased pension expenditures in the long term. Additionally, in this context it is important to point out that the focus of this study lies on sustainability, which is clearly only one side of the coin. As Leifels et al. (2010) demonstrate another important criterion to assess pension systems, the adequacy of pensions, is indeed strongly affected by these reforms. The authors show that especially for cohorts born between 1965 and 1985 the pension reform leads to significant pension gaps, i.e. these cohorts will be to a lesser extent able to cover their pre-retirement level of consumption than current retiree generations.⁴⁷

Assuming the same pattern as for ‘pure’ NDC pensions we may analyze the ‘dinosaur’ system of miners to check its sustainability in a scenario in which miners’ scheme would be separated from the NDC. Therefore, if we set aside the miners’ subsystem, analyzing their pension receipts net of miners’ contributions paid, the miners’ GAs are isolated, as plotted in Figure 24.

Figure 24: Generational Accounts for miners’ pensions, $r=3.0$, $g=1.5$, in real terms of 2007



Source: own calculations

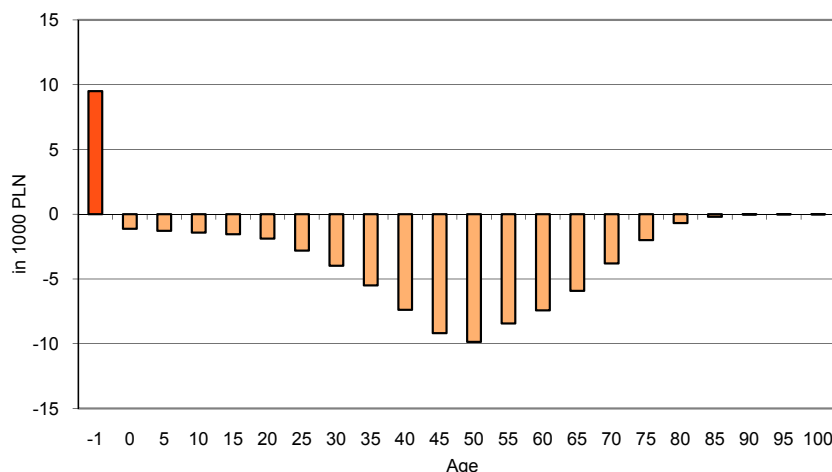
Unsurprisingly, miners’ GAs are shaped similarly to the no-1999-reform scenario, but the effect is even more visible. This seems to be a consequence of the situation where, for each PLN 1 paid into the system, an average miner receives PLN 3 in pensions, paid in most

⁴⁶ Sometimes referred to as quadruple burden.

⁴⁷ For an expanded description see Leifels et al. (2010).

cases in the age range of 47 to 55. Cumulated net receipts of a 50-year-old cohort amount to almost PLN 10,000. Consequently, we follow with the virtual miners' pension scheme FGB:

Figure 25: FGB for miners' pensions, $r=3.0$, $g=1.5$, in real terms of 2007



Source: own calculations

The Miners' pension system seems comparable to no-1999-reform FGB chart, but is far more extreme in its relative magnitudes. A newborn who will become a miner (with a certain probability) should bear a personal debt of PLN 9,000 to balance the miners' system in the long term. Such a system is very comfortable for its beneficiaries if it is highly funded from outside – in fact not only by other ZUS contributors, but all taxpayers via the current support from the government to ZUS.

4.1.2.5. Annual Cash Flows

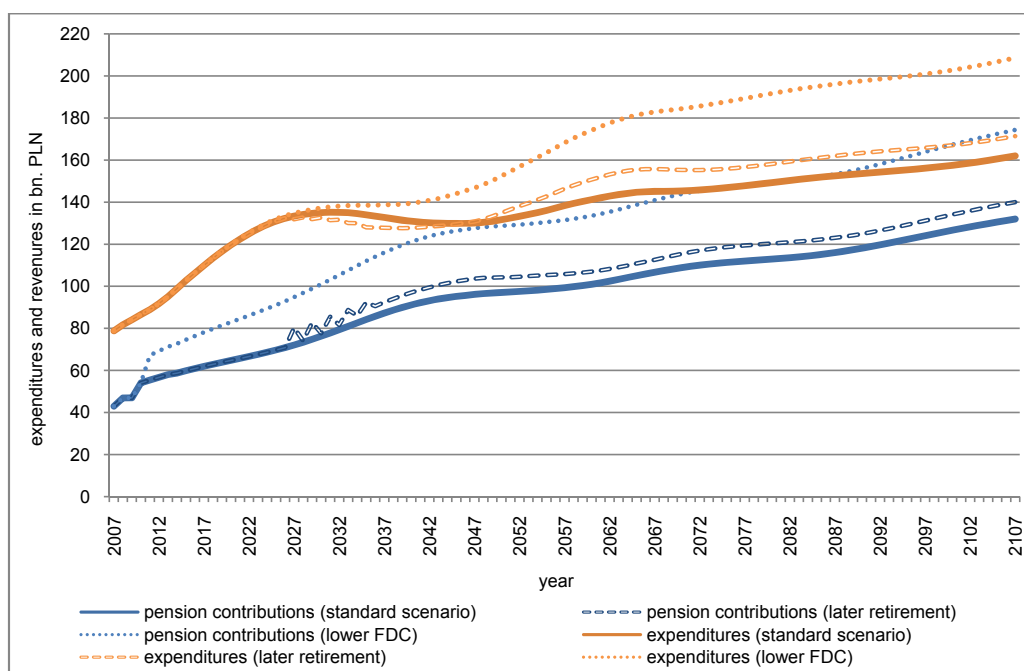
The GAs show long term sustainability improvement of the NDC pension system, but the single indicator trap has to be avoided. Complementary analyses of the cash flows⁴⁸ show additional consequences of the proposed reforms, to be followed in Figure 26 and Figure 27. Most importantly, these annual cash flows demonstrate the timing effects. In other words, they show the development of expenditures and revenues in the coming years. With the indicator of annual cash flows we follow closely the perspective of the Ageing Working Group (AWG) and the so called 'walking forecast' of the ZUS, which analyzes the future flow of age-related revenues and expenditures. For the sake of simplicity the miners' pensions and bridging pensions were excluded. In order to get a basis for comparison with the AWG results we implemented here the time varying growth rate of the AWG⁴⁹. In comparison to the stock values the following (flow-) figures are not calculated as present value, i.e. the discount rate equals zero.

The visible bump in pension expenditures, sharply falling after year 2027, is a consequence of the phasing out of the old system. The drop is a remote echo effect of the pension formula, gradually decreasing contribution rate (from 19.52% to 12.22%) and a longer working period of both men and women. Furthermore, the specific structure of the Polish demography – described in chapter 3.2.1– plays a role in the sharp increase of pension expenditures until 2026. While relatively large cohorts will go into retirement in the coming years, smaller birth years follow after the year 2026.

⁴⁸ Including NDC, minimum, miners and bridge pensions.

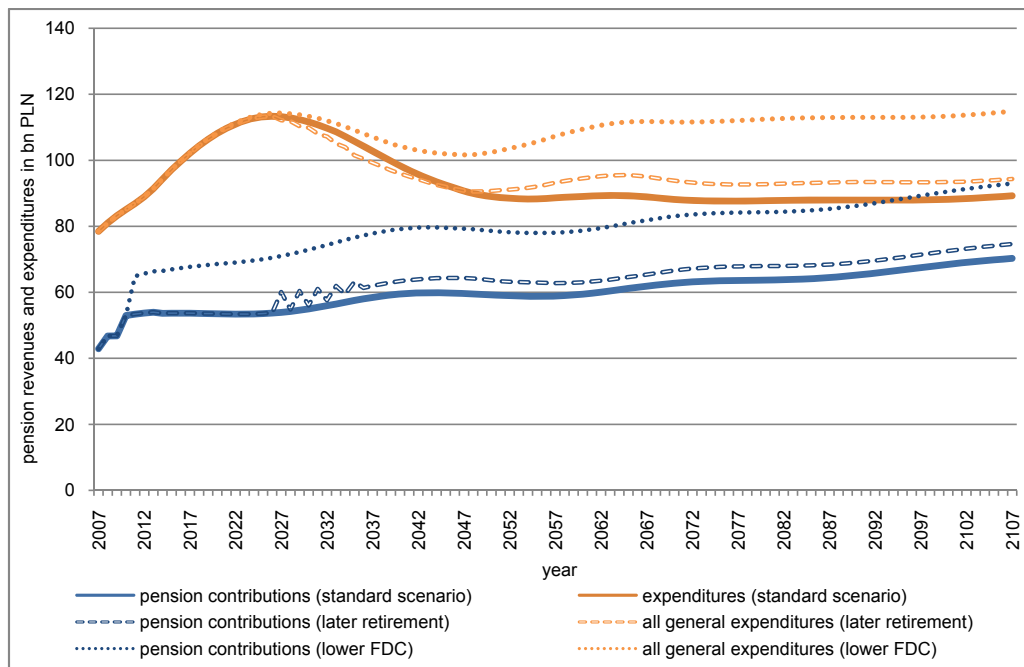
⁴⁹ For details, see Figure 3.

Figure 26: ZUS development of pension revenues & expenditures reform scenarios (g=AWG; r=0)



Source: own calculations

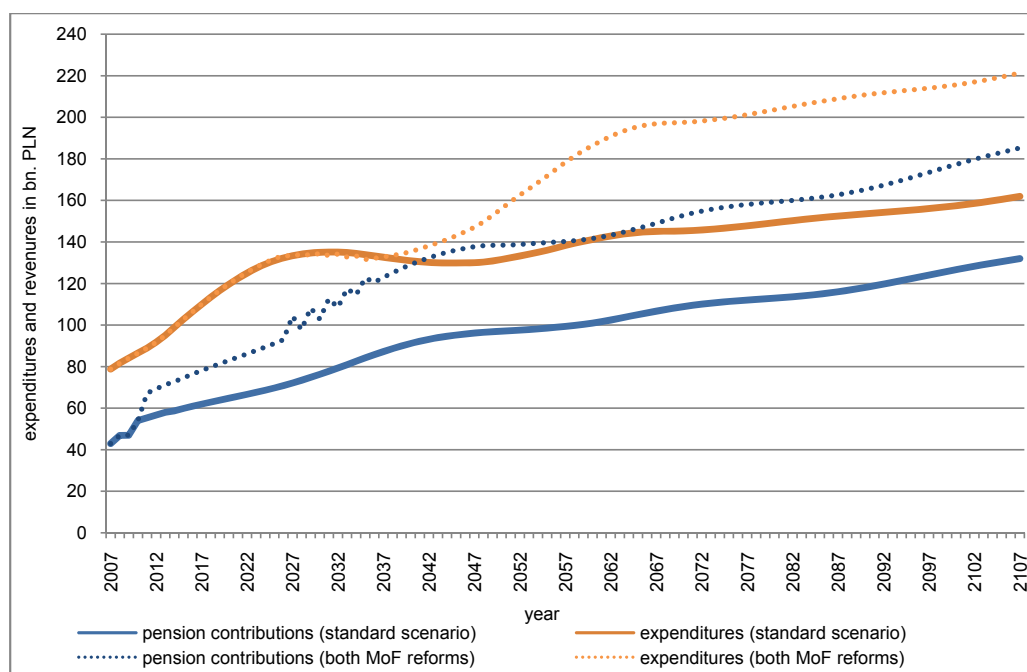
Figure 27: ZUS development of pension revenues & expenditures reform scenarios (g=1.5, r=0)



Source: own calculations

The *status quo* translates into the GAs scenario with the 1999-reform presented in e.g. Figure 22. As plotted in Figure 26 and Figure 27, despite higher AWG growth assumptions, the longer working period for women results in sluggish reaction on the revenue side of the pension fund. The kinks in the plot for years 2026-2035 reflect the transition period, described in the assumptions of the reform. The reaction time on the expenditure side is longer, but still visible: a longer working period means significantly less pensions paid in the transition period. However, longer work also implies longer accumulation of NDC accounts, resulting in higher pension payments. When the entire population of (female) pensioners retires later with a correspondingly higher pension – around 25 years after the beginning of the transition period – the overall pension expenditures turn out to be considerably higher than in the status quo. To some extent, lowered FDC contributions reform results would go in the same direction, but with a higher magnitude. An immediate and huge increase in cash revenues, resulting from the change in higher NDC share, would much quicker remedy the cash deficit of the ZUS pension fund. The expenditure side holds in the status quo scenario until the time of retirement for the affected working population, starting around 2034. Further higher expected pension payments stay in proportional relation to the increased inflow of pension contributions 25 years before. Cumulated results of both reforms are plotted in Figure 28.

Figure 28: ZUS⁵⁰ development of pension revenues & expenditures cumulated effect of reforms' scenario (g=AWG, r=0)



Source: own calculations

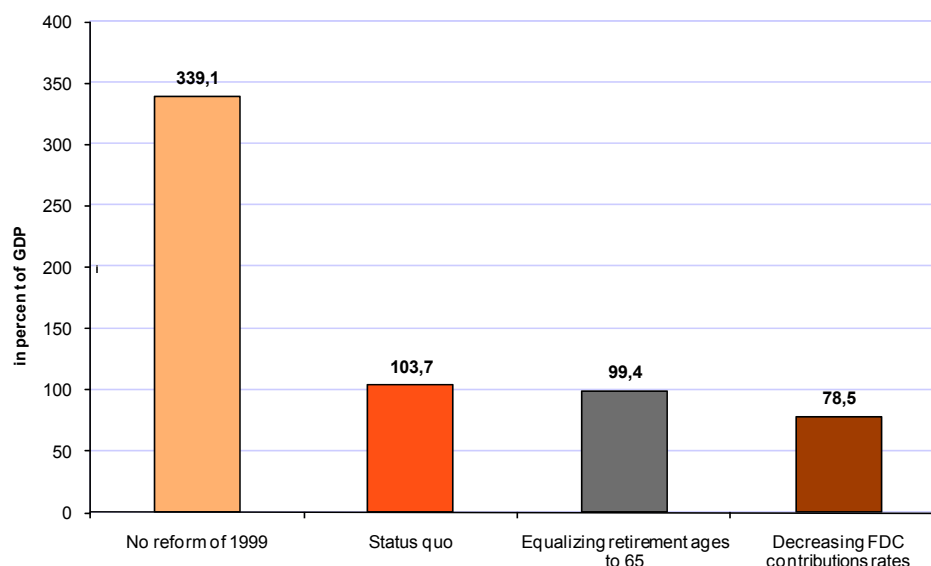
Lower deficit is observed in the case of high growth rate (AWG), which can be explained by pension indexation rules. While revenues grow per capita with the general wage growth, pensions are indexed “only” by 20% of the general wage growth.

⁵⁰ Including NDC, minimum, miners and bridge pensions.

4.1.2.6. Fiscal gaps and sustainability indicators for the ZUS pension fund

Figure 29 shows pre- and post-1999-reform sustainability gaps together with the expected change due to women longer working period and a cut in FDC contributions. The chart confirms general observations described in the GAs analysis: the implementation of the NDC accounts had a significant influence on the long-run fiscal stability. It lowered the sustainability gap by almost 250% of the GDP. In other words “only” one time GDP value from the base year has to be set aside in order to finance all future deficits of old age ZUS-pension. In the no-1999-reform scenario 340% of GDP have to be put aside to run the system until infinity. As has been shown in the previous sub-chapter most of the implicit liabilities in the status quo scenario arise from the double burden of the 1999 reform. As a consequence of this reform, entitlements of the old pension system have to be paid by lowered PAYG contributions (dropping from 19.52% to 12.22%). This leads to a significant mismatch of contributions and expenditures in the transformation period, mainly in the coming 30 years (see also box 1). Nevertheless, it will take roughly until 2080 to totally phase in the new NDC system.⁵¹ Figure 29 also illustrates once again the relatively minor sustainability impact of the increase of female retirement age. The FDC cut reform, which brings back to the NDC scheme half of the contributions transmitted before to the FDC, shows some improvement of the sustainability gap, though not by half, but only barely by 20%. It confirms our conclusion that the factor that plays a key role for the improvement of the sustainability was the introduction of the individual accounts for each member of the NDC scheme in 1999.

Figure 29: Fiscal gaps of ZUS old age pension system in different reform scenarios; $g=1.5$, $r=3.0$



Source: own calculations

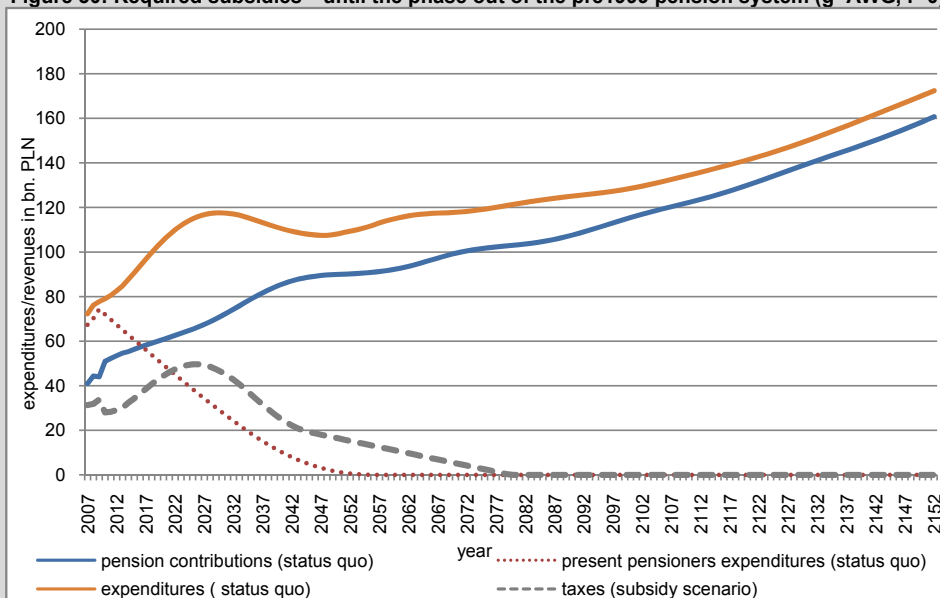
⁵¹ Not until the year 2080 will the last pensioner die who contributed a higher contribution rate than 12.22 %.

Coming to a conclusion, the sustainability of the ZUS (old age) pension system has been significantly improved by the reform of 1999. Especially the automatic adjustment of pension levels to demographic changes guarantees a better stability of long term pension finances. Due to the so called double burden – caused by relatively high entitlements to be financed by lowered (PAYG) contributions – however, we can expect a considerable mismatch of contributions and expenditures in the coming 30 years. How this deficit will be financed – whether by tax payments, on the basis of a (partial) shift of contributions from FDC to NDC, or by longer working periods – has to be decided by politicians.

Box 1: Tax inflow or no tax inflow? The long run perspective

The term sustainability has become increasingly popular in politics and media in the recent decade. With its widespread use it also became clear that this word is used and defined very differently – and is often even misused. Generally, it is agreed that when taking the sustainability perspective we want to find out whether a (legally defined) system can be run until infinity. Against this background, one can criticize our approach to allow no tax inflow into the isolated pension system. At present about 30% of ZUS revenues are financed by the state budget. So the crucial question is whether we should project this tax inflow into the future, too, when isolating ZUS pensions. According to the legal rules of the status quo there is no binding and clear rule that deficits shall always be covered by the state budget. The deficit of the ZUS, which has a certain degree of legal and economic independency, can also be covered from other sources: short term loans from the banks or expected one-off capital injections from the Demographic Reserve Fund. Therefore, we do not include tax inflow, and any other form of financing in the status quo scenario. But is this a politically realistic scenario? Most probably also in future budgetary years one will observe large tax inflows into ZUS. Some people might say that the double burden described above legitimates a tax inflow into ZUS – at least to the point when the new pension system is phased in totally. The old system is phased out to a large extent when present pensioners have died. As Figure 30 depicts after 2053 no expenditures arise from present pensioners in the base year. However, also after this year retirees receive as higher pension due to the fact that they have paid more than 12.22 percent in contributions. Hence the system is not phased in

Figure 30: Required subsidies⁵³ until the phase out of the pre1999 pension system (g=AWG, r=0)



Source: own calculations

⁵² From the year 2053 – when all present pensioners have died – until 2080 – when every pensioner has paid solely 12.22 per cent over his entire contribution career – we apply a linear phase out..

⁵³ Only for the NDC accounts – without miners and bridge pensioners.

completely until the last pensioner of this category has died – which is roughly the year 2080. Until this point in time relatively high pension entitlements have to be financed by low contributions of 12.22 percent. Hence, one could legitimate a inflow of tax money until the year 2080.⁵² The tipping point is whether the present pension system still runs large deficits after it is fully phased in. The answer is given in the following Figure 30. It shows the expenditures and revenues until 2150. This is, of course, a long projection period, so the results should be taken with caution due to a very great level of uncertainty about the longer future. Besides the phase out of present pensioners of the base year also a subsidy scenario is given. In this scenario we assume that the double burden of the pension system is financed via taxes until the system is fully phased in. Thereafter no taxes are paid to ZUS.

4.2. Other types of social insurance provided by ZUS

The current chapter collects the outcomes of the GA related calculations for the other analyzed age-specific benefits provided by ZUS. In accordance with the fiscal structure we divide the benefits as follows:

Disability insurance fund	Insurance fund for accidents at work	Sickness insurance fund
Disability benefits	Disability benefits resulting from accidents at work	Maternity benefits
Survivors' benefits	Survivors' benefits resulting from accidents at work	Sickness benefits

The above listed benefits do not encompass all types of social benefits provided by ZUS. However, only for these benefits the micro source data was fully or partly available. Altogether, the micro data of other than pension related expenditures provided by ZUS amounted to 41.4 bn or 33% of the total ZUS expenditures in the base year. Together with pension and pension related expenditures they cover around 95 bn, or 95% of total ZUS expenditures in 2007.

4.2.1. Disability insurance fund

Disability and related survivors' benefits are also very high expenditure items, next to old age pensions, of age-related benefits provided by ZUS. The **disability benefit** is provided to persons who are incapable to work and completed the criterion related to a sufficient number of contributory and non-contributory years. There are two statuses of incapability to work: partial and complete incapability. Each status of incapability to work stands for different entitlement amount⁵⁴.

Disability contributions are obligatory for the same group of the working population as the pension contributions, but the contribution burden, originally shared in equal parts between employer and employee drifted across last years towards a higher burden financed by the

⁵⁴ The benefits paid from the Disability Insurance Fund are not related to incapability to work related to accident at work. The latter category of benefits is paid from the Work Accident Insurance Fund.

employers. The main source of the revenues are social contributions related to disability and additional internal transfers within FUS. The revenue side of the disability fund deserves special attention due to the fiscal reform, resulting in cuts in disability contributions introduced in three stages:

- from 1999 to 30 June 2007: 13.0% (of which employer's part 6.5% and employee's part 6.5%),
- from 1 July 2007 to 31 December 2007: 10.0% (of which employer's part 6.5% and employee's part 3.5%),
- 1 January 2008 6.0% (of which employer's part 4.5% and employee's part 1.5%).

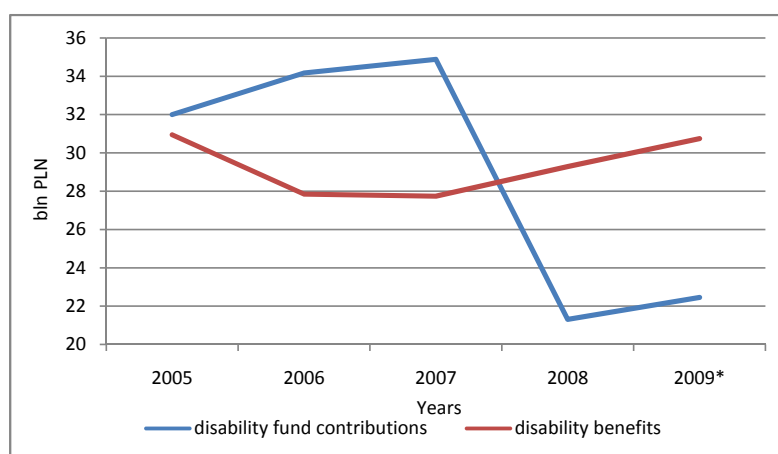
Figure 31: Disability contribution rates, %, years 1999-2009



Source: ZUS website

Significant cuts in contribution rates resulted in a sudden drop of the disability fund's revenues after 2007. However, probable additional cyclical effect of the financial crisis resulted in a smaller inflow of own revenues of the disability insurance fund.

Figure 32: Revenues and expenditures of the disability fund in years 2005-2009



Source: Justification of the state budget act, *2009 estimates

In the base year around 1,2mln persons were covered by the benefits paid due to partial or complete incapability to work.

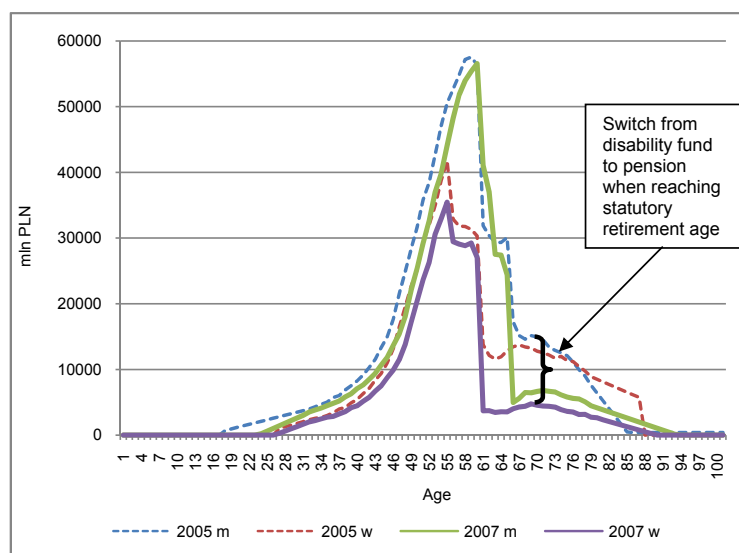
On the expenditure side the micro profiles were provided by ZUS. According to data provided for the base year, the disability benefits paid from the ZUS disability insurance fund to beneficiaries who suffer from disability (not related to accident at work), amounted to 11.9 bn in 2007.

4.2.2. Computation procedure for disability benefits

For the projection of disability benefits we used a 'standard' profile.⁵⁵ However, in order to reflect recent legal amendments as well as indexation rules a few further modifications have been made. First of all, we divided beneficiaries into present and future disability pensioners. For the present beneficiaries the computation is relatively straightforward. They are projected into the future taking into account expected mortality probabilities. Only one further amendment is needed - in order to reflect the new legal setting, namely the switch from the disability to old age pensions system at the new legal retirement age, man (woman) younger than 65 (60) in the base year, can get disability benefits only until these age limits. Only present male (female) pensioners older than 64 (59) in 2007 – who are mainly war veterans – keep receiving their (disability) annuities until their death. For new disability pensioners, i.e. beneficiaries who receive a pension for the first time after the base year, there are no exemptions. Their probability to be a beneficiary of disability pensions after the legal retirement age is zero. For a deeper examination of the separation and projection of present and new pensioners see Heidler et al. (2009). Profiles for 2007 for existing and new-coming ZUS disability fund beneficiaries as well as contributors were rescaled to aggregates of 2008 and 2009 to reflect the actual impact of legal changes. Such correction should reflect and extrapolate into the future a widening of the deficit of the disability fund, following Figure 31 and Figure 32.

Together with a sluggish positive effect on the expenditure side (disability benefits 27 bn in both years) stemming from the disabled persons who reached statutory retirement age switching to ZUS pension fund, the disability fund deficit deteriorated in 2008 and 2009 – see Figure 32. In the following years we assumed a continuation of fund's self-financing constraints due to low contribution inflows (lower rates) and moderate influence of the war veterans' benefits, who keep receiving their disability benefits despite reaching statutory retirement age.

Figure 33: Profile differences between disability beneficiaries in 2005 and in 2007, in million PLN



Source: own calculations on basis of the data provided by ZUS

⁵⁵ The presumed consequences of recently rejected reform proposals, which aimed to link the disability benefits with the NDC account stocks, were not taken into our computations.

It is important to stress that fairly easily accessible disability benefits were broadly used in the past as a source of escape into early retirement. In recent years numerous legal amendments prevented such behaviour. Analyses of profiles provided by ZUS in this respect for years 2005-2007 do not yet reflect this process – its full impact is to be expected in the coming years. Additional ‘new’ progress can be expected in the coming years due to the cut of early retirement rules – described in chapter 4.1.2.3. This legal change can lead to a behavioural feedback observed also in other European countries. Individuals simply might try to retire earlier by getting the status of being disabled.⁵⁶ However, due to a significant uncertainty of the magnitude of these two processes, their probabilities were not introduced into our computations.

Another group of ZUS beneficiaries who generates significant costs are **survivors**. Survivors are members of the family who continue to receive a certain percentage of the benefit originally assigned to a employee, a disabled beneficiary or a pensioner. Survivors’ benefits are financed from two funds: disability insurance fund and insurance fund for accident at work. No accident-at-work related survivors’ benefits amounted in 2007 to around 18.3 bn, paid to 1.3 m of beneficiaries, compared to 0.5 bn of accident-at-work related benefits, paid to 0.2 m of beneficiaries.

There are no survivor specific revenues, whilst their benefits are a ‘derivative’ of the original benefit – in most cases disability benefit, and to some extent they relate to pre-retirement benefits and old age pensions. It is vital to underline that survivors’ benefits in our computations are not derived from the original pension benefit, as it happens in reality. Therefore, we presume that our forecast gives a slightly overestimated picture of future survivors’ benefit burden. Recently, the number of disability payment beneficiaries stabilized, which may suggest that recent legal restrictions put on disability benefits may curb the previous probability to become a beneficiary. In this respect our results may be to some extent exaggerated for survivors’ benefits that are related to primary disability benefits. However, so far we stick in our GA calculations to the probabilities to become a survivor at an unchanged level in the future. Therefore, for survivors we project their profiles of the base year into the future without any major modifications.⁵⁷

4.2.3. Sickness insurance fund

The next category to be analyzed consists of benefits paid from the sickness insurance fund. It covers benefit categories provided in the case of temporary incapacity to work. In respect of sickness and maternity the following types of benefits are provided:

- sickness allowance,
- maternity allowance,
- care allowance,
- compensatory allowance,
- rehabilitation benefits.

Compulsory sickness insurance does not cover the same number of persons that are insured by the pension and disability insurance. The smaller probability to become a beneficiary of the sickness benefit relates to the different risk exposure of professions. Contrary to pension and disability insurance, for which the insurance costs are shared by the employer and the employee, the sickness insurance contributions are paid entirely by the employee at the rate of 2.45% of gross income. As in the case of other funds of FUS, the revenues of the Sickness Insurance Fund consist mainly of contributions and partly of other revenues, as

⁵⁶ It will be interesting to analyze these behavioural responses after the full implementation of stricter early retirement rules, i.e. looking on micro data of 2009 and thereafter – then available.

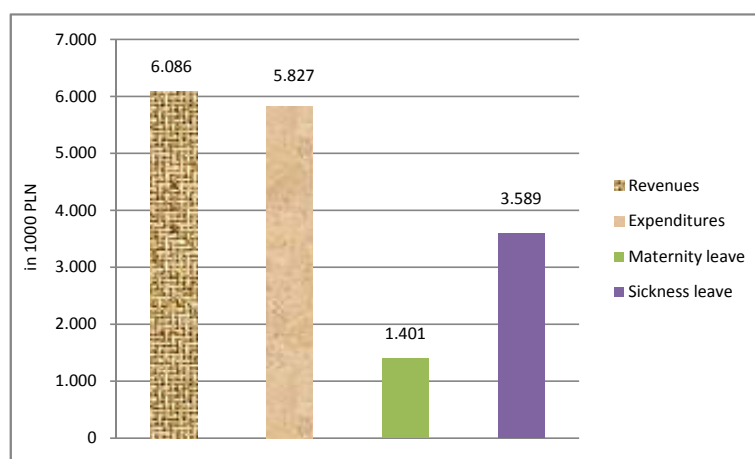
⁵⁷ In order to reflect indexation rules, however we separate also here into present and new pensioners.

presented in Figure 34. The main categories of expenditures amounted to 3.6 bn (sickness benefits) and to 1.4 bn (maternity leave benefits), which together summed up to 5 bn or 86% of total fund expenditures.

4.2.4. Computation procedure for sickness and maternity leave benefits

Micro-profiles for other types of benefits covered by this fund, like long-term care assistance, were unavailable. Since the profiles for both maternity leave benefits and sickness leave benefits were not provided but actually created on the basis of the number of sickness leave and maternity leave days per year per cohort, the simplest method of extrapolation of profiles for existing beneficiaries was applied.

Figure 34: Revenues and main aggregates of expenditures of the sickness fund, in million PLN, 2007

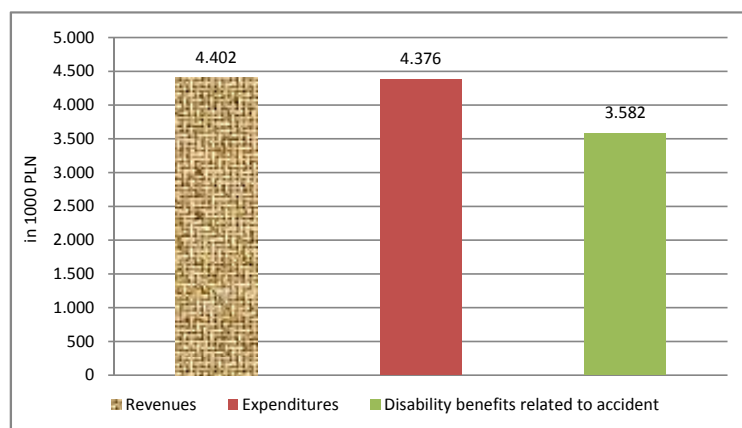


Source: ZUS

4.2.5. Insurance fund for accidents at work

The subsequent category covers benefits related to accident at work and survivors' benefits related to accidents at work. Apart from accidents at work, this type of insurance covers occupational diseases, in specific cases of work in special (harmful) conditions or work of special characteristics. Contributions are paid entirely by employers, at a progressive rate starting from 1.67% of gross income. The contribution rates depend on the work-related risk of harm or accident, set differently for different occupations. Actually, all revenues of the accident fund are covered from the contributions. Base year expenditures for benefits related to accident at work to disabled persons and survivors covered over 80% of overall fund's expenditures. In the base year there were around 220,000 disabled beneficiaries and around 30,000 survivors paid from this fund. Micro-profiles for the Insurance fund for accidents at work were provided by ZUS, and needed no refinement. Figure 35 illustrates amounts involved for the Insurance fund for accidents at work in the base year:

Figure 35: Revenues and main aggregates of expenditures of the Insurance fund for accident at work, in million PLN, 2007

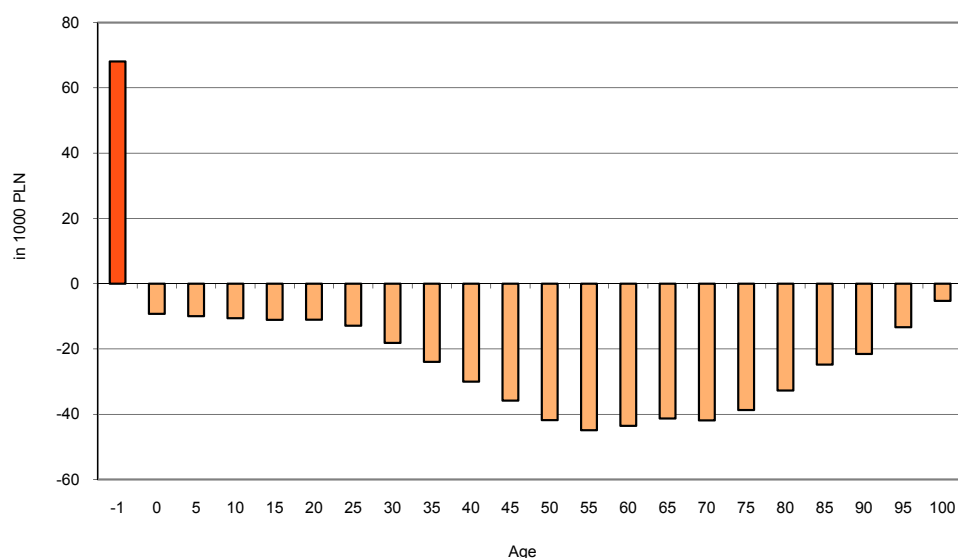


Source: ZUS

4.2.6. Generational Accounts, Fiscal Gaps and Sustainability Indicators for other types of social insurance provided by ZUS

The following Figure 36 illustrates the generational accounts for the disability fund (disability and survivors financed only from disability contributions, no 'tax' inflow), Insurance fund for accident at work (accident benefits with accident related survivors' benefits), and finally the sickness fund (sickness and maternity leave benefits financed also only from the inflow of contributions). The highlighted column on the left hand side stands for the burden of future generations.

Figure 36: Generational Accounts and FGB for ZUS disability fund, 2007

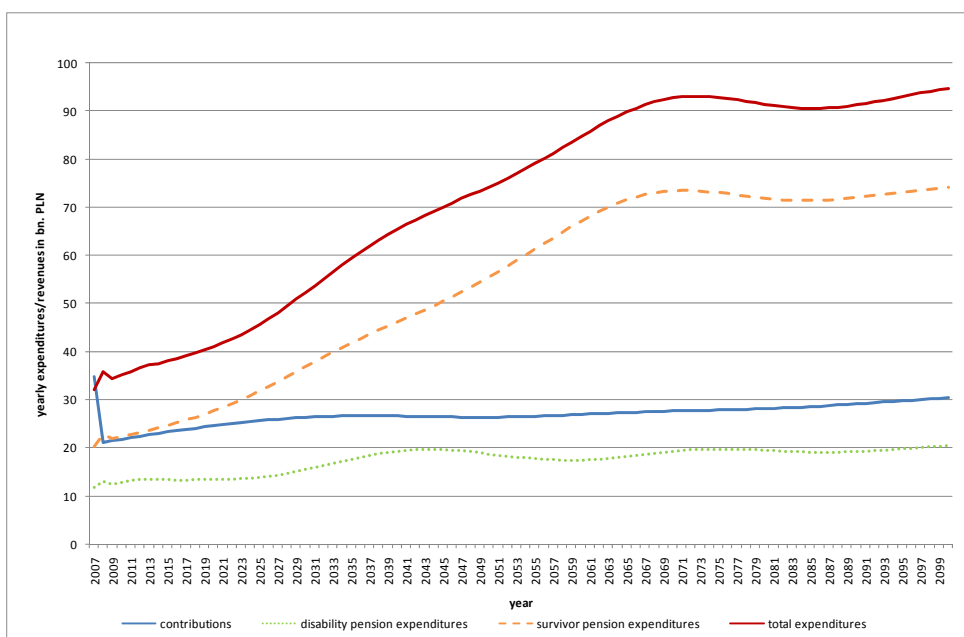


Source: own calculations

The sustainability gaps for three remaining ZUS social funds follow closely the level of deficit in the base year: the disability fund shows a sustainability gap of almost 97% of GDP, whilst the accident and sickness funds almost net each other in terms of sustainability.

GAs for the disability fund show a significant sustainability gap and FGB. Its shape seems very similar to the old PAYG-type of pension scheme or no-1999 reform and miners GAs. The base year deficit and expected significant further disproportion between revenues and expenditures petrify the adverse financial condition of the fund.

Figure 37: Cash flows development forecast for Disability Insurance Fund, $g=1.5$, $r=0$, base year 2007



Source: own calculations

We may initially conclude that:

- A lower contribution rate decreases the fiscal burden imposed on gross incomes, which could spur households' consumption and savings.
- one can expect a high deficit borne by disability insurance fund during economic downturns, to be covered from state budget transfers (in fact taxes) or financial liabilities – now as in the future.

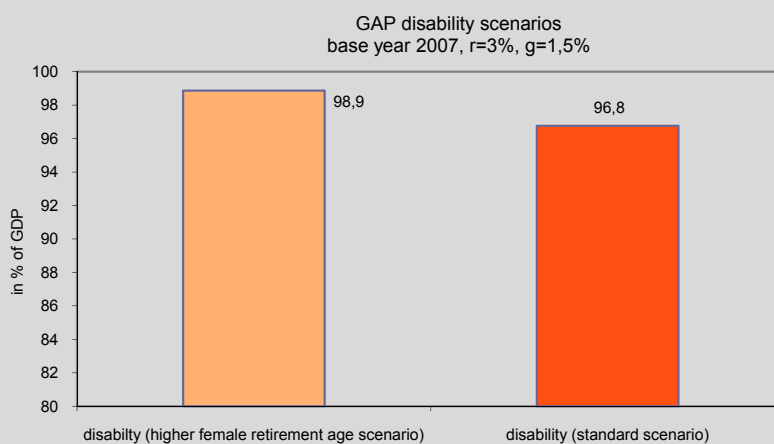
Our indicators suggest that the disability fund can be a threat to the low deficit and stable public finances in the long run more than the ZUS pension fund. While ZUS old age pensions impose a challenge on the public finances in the coming 30 years – due to high transformation costs of the partial switch from the PAYG to the funded system – the disability fund shows an increasing deficit not only in the next three decades but also thereafter.

GAs for the Insurance fund for accidents at work give a slightly better impression than the disability insurance fund. Though main payments refer to disability payments, which in this case are accident related, a better correspondence between Insurance fund for accident-at-work contributions and expenditures (lower deficit) suggests how important role is played by the deficit of this fund in the case of this type of scheme. We will recall that the contribution rate for the Insurance fund for accidents at work in principle is set at the level of 1.67% of gross salary. However, if the risk of injury at work is higher, the contribution rate is adequately increased to even 8%. Due to data quality and the applied rather conservative approach, the authors assumed the time invariant structure of contribution rates among contributors. In consequence our computations may differ from the actual development of the GAs for this fund, if the above-mentioned distribution of the contribution rates changed.

Box 2: Impact of higher female legal retirement ages on the disability fund

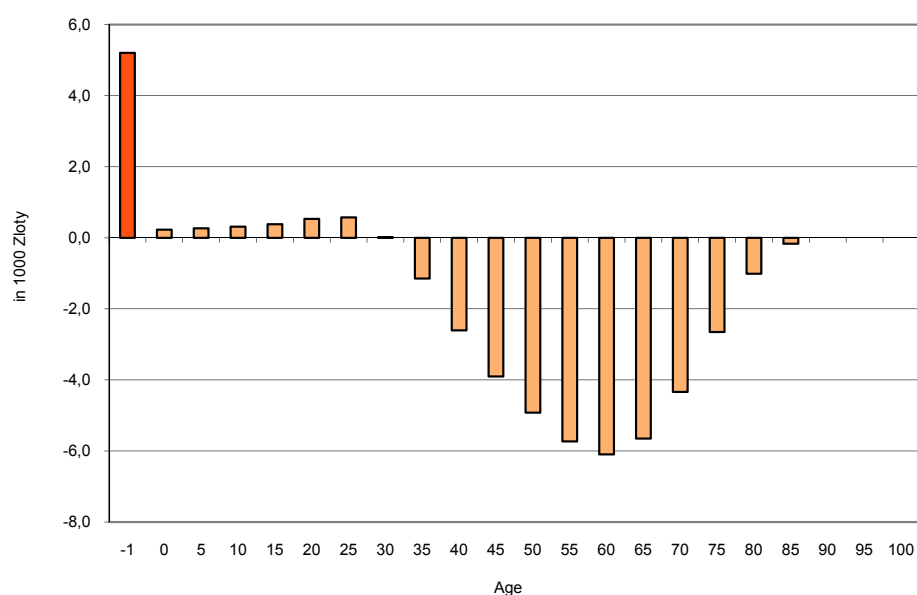
In our standard scenario we always tried to reflect the current legal status. Of course, politicians might decide to change the legal setting in the coming years. One such reform scenario concerns the increase of the legal retirement ages – described in greater detail in chapter 4.1.1. First of all this reform changes the conditions to receive an old age pension. It is, however, interesting that it has also a significant impact on the future disability expenditures, since longer working period for women implies also longer disability benefiting periods. As a consequence, the disability gap would increase in this reform scenario by roughly 2 percentage points – see Figure 38. This is just an example how legal changes of one fiscal system have a direct impact on other institutions. It highlights the fact that it is worthwhile taking the overall fiscal perspective when analyzing reforms.

Figure 38: Sustainability gaps for disability in the case of different retirement scenarios



Source: own calculations

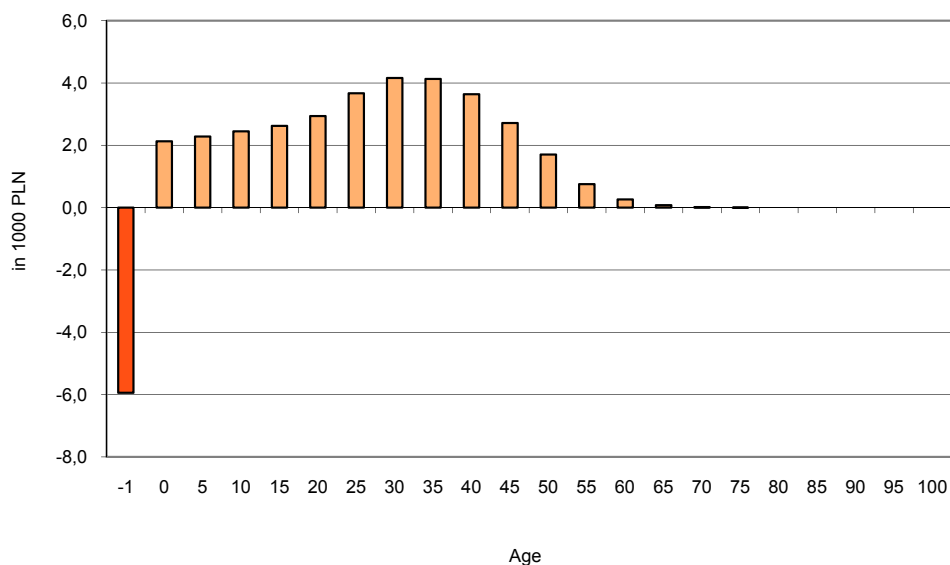
Figure 39: Generational Accounts and FGB for ZUS Insurance fund for accidents at work, 2007, in million PLN



Source: own calculations

The GA for the sickness fund paints a much more optimistic picture than in case of the disability and accident fund. Actually, so far it's the first unit which shows GA surplus. There are a few explanations for this phenomenon: we repeat that there are two major categories of sickness fund payments – sickness leave benefits and maternity leave benefits. Both of them are paid temporarily, and what is most important for long term sustainability: both types of benefits are paid to the working population, which will not grow considerably in comparison to pensioners. For the case of maternity leave we take into account that in the future decades there will be a decreasing number of women who can benefit from maternity benefits, i.e. fewer females aged 19 to 40. Therefore, maternity expenditures will grow at a relatively low pace. For our calculation, we take, however, one simplifying assumption: the probability to receive a maternity leave at a given age stays constant over time, i.e. we apply a constant profile over time. This assumption is inconsistent with the fertility forecast we apply for our population projection (see chapter 5). In this case we assume – based on Europop2008 – slightly increasing fertility rates until 2060. Further research could consider time-varying age specific probabilities to receive a maternity benefit. However, we assume that lack of this shift in maternity benefits does not bias our results to the extent where we would change the conclusions. FGB of the sickness fund could suggest the possibility to lower its contribution rates, since future generations receive a “gift” from living generations (first highlighted column on the left hand side). But the sickness fund is one of the four FUS funds, three of which show relatively significant sustainability gaps. Cash surplus of this fund might then lower the overall FUS cash deficit.

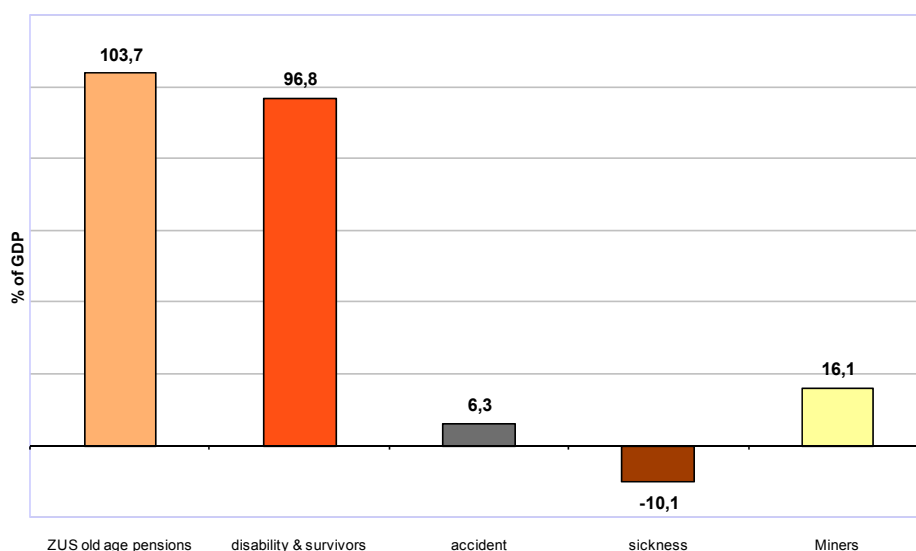
Figure 40: Generational Accounts and FGB for ZUS sickness fund, 2007, in million PLN



Source: own calculations

Figure 41 indicates sustainability gap comparison of the three remaining social insurance funds, which form together the FUS in comparison to ZUS NDC pension fund and miners' fund.

Figure 41: Comparison of sustainability gaps between different types of benefits provided by ZUS, 2007, % of GDP



Source: own calculations

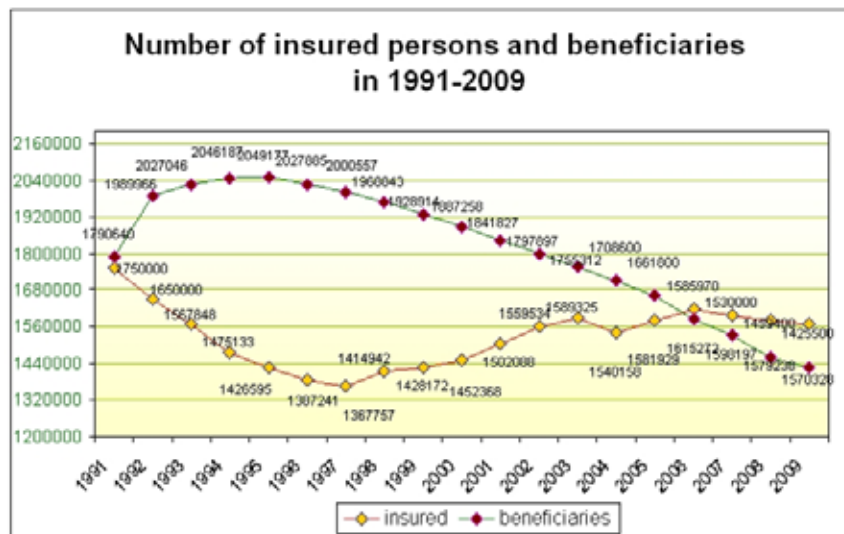
Bearing in mind the above-mentioned analysis we may conclude that:

1. The most significant sustainability gap of the three analyzed funds results from the disability benefits. The reason for long term instability lies in the significant legal cut of contribution rates combined with the benefit formula, which assumes no relation between the amounts of contributions and related benefit levels.
2. Due to recently observed stabilisation of the number of disabled beneficiaries, the survivors' benefits shall follow their development and stabilize as well.
3. However, the increase in statutory retirement age introduced by the 1999 pension reform may encourage to seek for earlier retirement through disability benefits. On the basis of available data it is difficult to evaluate to which extent the legal system density prevents cheating with regard to disability benefits in a longer term.
4. Certainly, from a modeller's point of view, survivors' benefits should be derived from the original benefit rather than from the development of currently existing micro-profiles.

4.3. Social insurance scheme for farmers

Farmers pension and disability system was formed in 1990, when it was separated from the ZUS insurance system. It is represented by the Agricultural Social Insurance Fund (KRUS), which consists of 5 funds. One of them, Pension and Disability Fund (FER) was established for pension and disability resources and payments. The fund covered around 1.6 m of insured persons and beneficiaries in the base year. Both figures started decreasing in recent years, as depicted in Figure 42:

Figure 42: Number of insured persons and beneficiaries in FER, years 1991-2009



Source: KRUS website

Pension and disability contributions for farmers are paid quarterly, as a lump sum fixed at the level of 30%⁵⁸ of monthly farmer's pension. It amounted to PLN 179 in the base year. Farmer's pension was also a monthly lump sum at the level of PLN 597 in 2007. The consequence of significant disproportion between small amounts of paid contributions and much higher pensions and disability benefits is the high deficit of FER: its main source of revenues are current transfers from the state budget, which cover around 93% of all revenues, and only 6% comes from the contributions paid by farmers⁵⁹. However, it cannot be neglected that the deficit also results from the decreasing participation rates of younger cohorts in KRUS. Simply speaking, year by year fewer young persons choose to enter the farming sector. As a result, a decreasing number of contributors enter the KRUS-system. Hence, not only demographics and the benefit/contribution structure play a role in the financing of KRUS but also cohort specific participation rates. We shall come back later to this aspect. FER expenditures are mainly spent on pension and disability benefits. Some part of the state budget transfers for FER are redirected to the National Health Fund as substitute of farmers' health contributions. According to our assumptions on isolation, as in the case of ZUS, here we do not take into account other types of fiscal burdens paid by farmers to the state and local budgets (VAT, PIT, rural tax) or to the social insurance system (e.g. in the case of additional insurance in ZUS). Certainly, part of them, due to the decision of the state or local government on allocation of transfers is paid back to farmers. However, the amount of government support does not stand in direct relation with the amount of pension and disability entitlement of an individual⁶⁰.

Statutory retirement age for men is 65 and 60 for women. Though there are possibilities to retire earlier, by five years respectively, comparing to the general FUS system, both men and

⁵⁸ Amounting currently (June 2010) to 10% of basic farmer's pension.

⁵⁹ Recently introduced reform, which aims at increase in contributions inflow from bigger and wealthier farms was not reflected in the computations due to lack of data. Starting from IVth q2009, farmers, who own over 50 hectares (around 123 acres) of field, pay additional monthly contributions – progressing in accordance with growing area of owned land. Recent figure, which take into account the first effects of mentioned contribution raise suggest that pension and disability contributions may be even doubled (1st q2010).

⁶⁰ In this respect our results do not stand in opposition to results of Soszyński (2009), who considers all fiscal revenues paid by farmers (e.g. VAT) and transfers received, as we consider only social contributions and all transfers received. The difference in interpretations and conclusions may stem from the different methodological approach.

women insured in KRUS in principle tend to work (and contribute to KRUS) until the statutory retirement age.

Pension scheme for farmers is a typical unfunded defined benefit scheme. There is no correspondence between amounts of paid contributions and level of benefits. Pension benefits are paid as a lump sum, based on the criterion of sufficient number of contributory years in farmers' scheme – 25 years for both men and women.

4.3.1. Computation procedure for farmers' pensions, disability, and survivors' benefits

The input data for the amounts of farmers' pension and disability contributions were provided upon request by the Farmers' Social Insurance Fund, in 6-year long, unisex cohorts. The extended, gender-specific profile was based on own calculations with the use of Demographic Yearbook of Poland (2008, CSO). Data on the number of contributors were unavailable for the base year, so the original profile was divided per capita with nominal amounts of annual contributions (four times quarterly contributions per insured person), which roughly satisfied the aggregated annual inflow of farmers' pension and disability contributions.

The contribution side was developed according to the probabilities derived from the micro-profile. The method of computation of the expenditures side of generational accounts for farmers (pensions, disability benefits and survivors' benefits) is similar to ZUS disability and survivors' benefits. On the basis of micro-profiles, provided upon request by the KRUS, the probability to become a beneficiary-farmer for newcomers was tackled separately⁶¹. Micro profiles for existing beneficiaries as well as the newcomers were estimated on the basis of age and sex specific expenditures for single year cohorts and weighted with the population size.

However, comparing with the other types of GA calculations one important change has been introduced to the new pensioners' profile. Due to the observed process of outflow of farmers from the farming sector (here elaborated on the basis of the pace of a decreasing number of persons insured in KRUS in years 2000-2007, as shown in Figure 42), we decided to introduce a modification into the number of newcomers to the pension system each year. According to our assumption, which in principle follows the assumptions of the expertise made by IAFE-NRI⁶² (2009) – illustrated in further detail in Figure 43 – the number of persons insured in KRUS shall fall from 1.6 m⁶³ in the base year to roughly 630,000 in 2050.⁶⁴

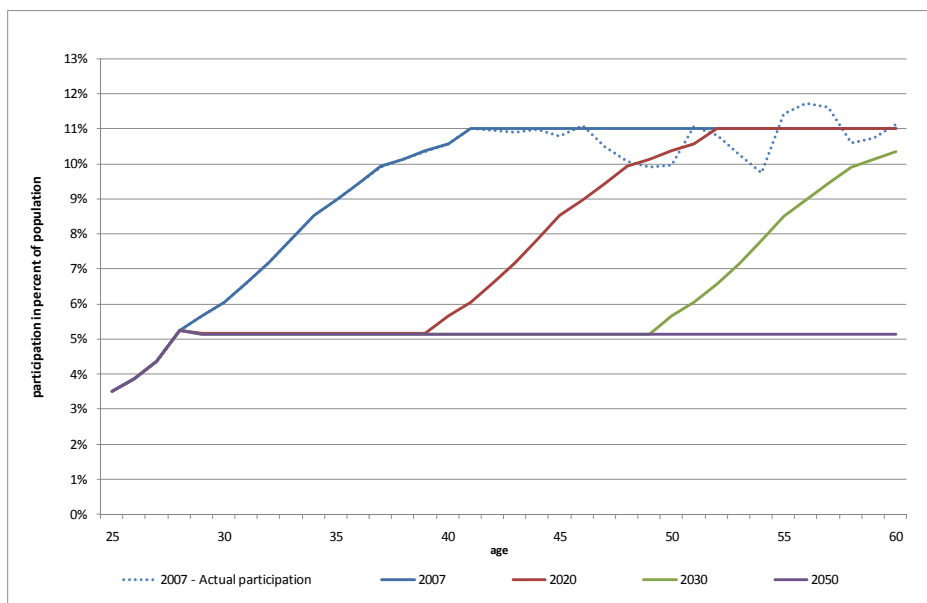
⁶⁰ In this respect our results do not stand in opposition to results of Soszyński (2009), who considers all fiscal revenues paid by farmers (e.g. VAT) and transfers received, as we consider only social contributions and all transfers received. The difference in interpretations and conclusions may stem from the different methodological approach.

⁶¹ More details on the separation method in chapter on 'Other types of social insurance provided by ZUS'.

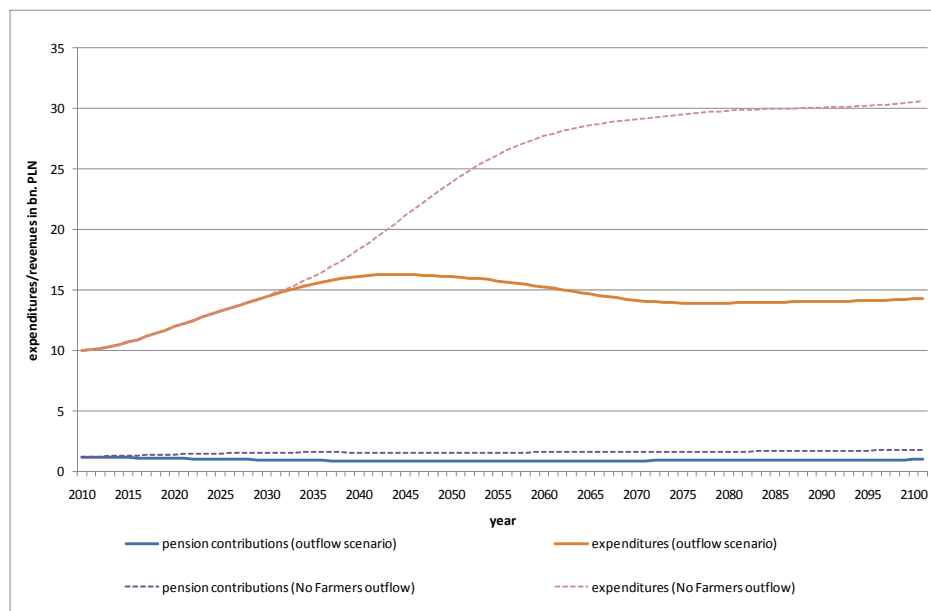
⁶² *Instrumenty oddziaływania Państwa na kształtowanie struktury obszarowej gospodarstw rolnych w Polsce; rola systemu ubezpieczenia społecznego rolników w kształtowaniu tej struktury. Stan obecny i rekomendacje na przyszłość oraz propozycje nowych rozwiązań dotyczących tego obszaru dla systemu ubezpieczeń rolników*; expertise LED by A. Sikorska for the Ministry of Agriculture and Rural Development, Institute of Agricultural and Food Economics - National Research Institute (IAFE-NRI), 2009.

⁶³ KRUS website.

⁶⁴ This drop by 60 % can be partially explained by the decline of the working population in the coming decades. From 2007 to 2050 the overall size of the age groups 20 to 60 will shrink by roughly 35 %. The residual can be traced back to the drop of the participation rates in the farming sector and respectively in KRUS. We define this participation rate here more precisely as the ratio of overall insured in KRUS (whether pensioners or contributors) to the overall population – of the respective age groups. While this participation rate amounted to an average of roughly 8 % for the age groups 20 to 60 in 2007, we assume that it will shrink to about 5 % in 2050 – see Figure 43.

Figure 43: Projection of participation rates in KRUS pension system

Source: own calculations

Figure 44: Development of FER revenues and expenditures. Scenarios with outflow and no-outflow, ($g=1.5$, $r=0$), 2007

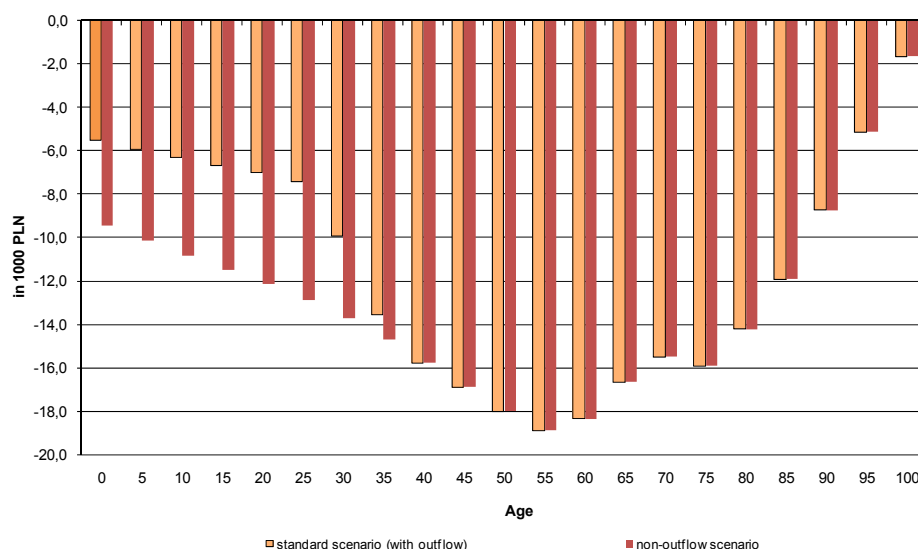
Source: own calculations

In consequence we show two options: 1) the *standard* or *the outflow scenario* in which we assume an outflow of farmers across coming decades and 2) the *non-outflow scenario* in which the age-specific probabilities to be an insured person and a beneficiary in the base year remains unchanged in the future. Depending on the version, the ZUS pension fund was adjusted accordingly. In other words the outflow of farmers corresponds to an equal inflow to ZUS. Expected development of cash flows in both scenarios is plotted in Figure 44. It is interesting what a huge impact the outflow of insured persons has on the cash deficit of the fund – which gives yet more evidence of the ‘devastating’ effect of generous benefit formulas of the old type of social insurance system on the solvency of the social scheme. Even in the outflow scenario large disproportions between contributions and benefits can be spotted.

4.3.2. Generational Accounts, Fiscal Gaps and Sustainability Indicators for farmers’ social benefits system

The GAs for farmers’ pension and disability scheme, plotted in Figure 45, give a rather negative impression. Its shape reminds the ZUS pension no-1999-reform scenario. In fact, due to quite comparable benefit formula and additional deep underfunding, it shouldn’t be a surprise. In the case of expected outflow of younger cohorts to the ZUS system, the GAs give a better economic prospect – the younger the cohorts are, the better off they become (or rather less badly-off) in terms of sustainability gap. The reason is clear, a smaller proportion of the population is participating in the unsustainable KRUS pension system – see Figure 43. As a consequence GAs shrink in absolute terms for younger cohorts. For already retired farmers, however, the outflow of younger cohorts has no influence. Their participation rate is constant in the outflow scenario.

Figure 45: Generational Accounts for farmers’ pension and disability fund, 2007



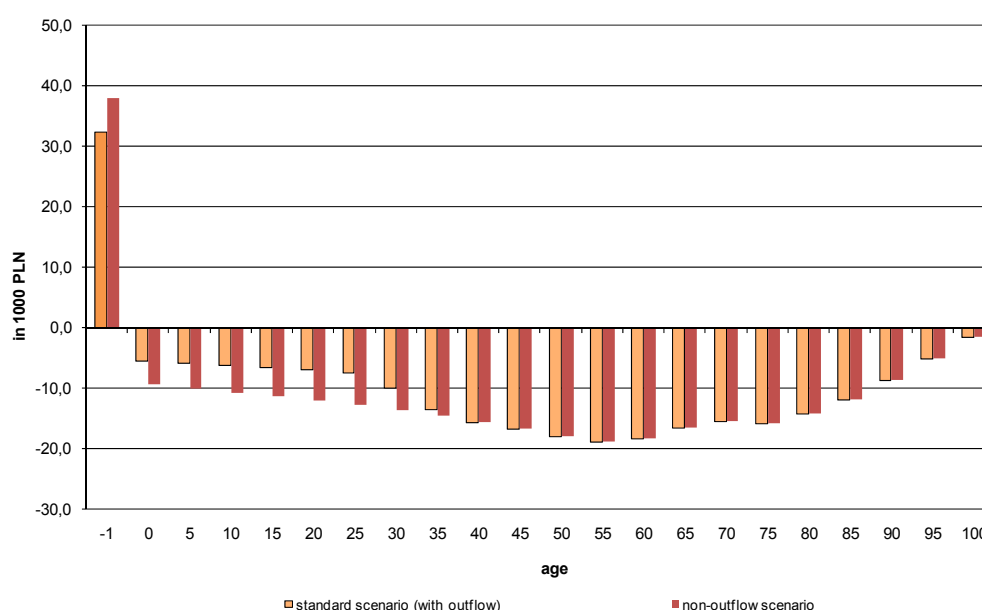
Source: own calculations

As a second indicator we examine the sustainability gap. There are also two scenarios: one for the outflow or standard scenario and second for no-outflow. In the latter scenario the sustainability gap would amount to roughly 60% of GDP. With the outflow of farmers

encouraged by higher average pensions to be expected from NDC/FDC, the fiscal gap would fall to 48% of GDP. Compared to other already analyzed isolated systems of ZUS, 'weighted' with their base year absolute amounts of expenditures, which are two or three times higher, the isolated farmers' fund without government support induces a huge sustainability gap.

The next indicator, the FGB gives comparable impression to the previous one: depending on the magnitude of expected 'migration' of farmers to ZUS, the FGB indicates a considerable additional burden for future generations. A 'theoretical' newborn of 2008 would have to pay respectively ca. PLN 38,000 or PLN 47,000 more than his 2007 counterpart, depending on the intensity of the outflow of contributors to the NDC scheme. Whatever scenario is taken as preferred, the isolated farmers' pension and disability fund is not sustainable.

Figure 46: FGB for farmers' pension and disability fund, 2007



Source: own calculations

4.4. Civil servants' social benefits system

The term "civil servants" in reference to the part of the social assistance system financed entirely from the state budget can be slightly misleading in Poland. Actually, it refers to two major groups of government employees: uniformed services and judges and prosecutors. In this system, there's no separate pension scheme for all civil servants, i.e. central and local government employees in Poland, as in Germany or the UK. Polish system of social benefits paid to the abovementioned two groups of government employees is recognized, in recently updated worldwide system of national accounts⁶⁵, as a system of social assistance, and not as separate public social insurance system, due to the lack of social contributions paid by its members. The system encompasses uniformed employees of the Ministry of Defence, Ministry of Internal Affairs, Prison Services, firemen, officers of Government Protection Bureau, Internal Security Agency, Intelligence Agency, Central Anti-corruption Bureau, Polish Border Guard, custom duties services and, already mentioned, judges and prosecutors

⁶⁵ SNA2008

(Ministry of Justice). The amount of pension is set in reference to the last three (monthly) salaries before retirement. The minimum retirement age is not required, while a uniformed services employee may become a pensioner after 15 years of duty, though at that point the benefit is paid in a limited amount of 40% of full pension. It explains the cases of 36 year old pensioners in our micro-profiles! A longer working period increases the percentage of final salaries taken for calculation of future pensions but the pension cannot exceed 75% of average salaries from the last three months of duty. Each year after the 15th year of duty adds to the retirement benefit an additional 2.6%, with lowered multipliers, if a civil servant worked outside the civil service. The maximum allowed percentage (75%) is applied if the civil servant collected the sufficient amount of years in civil service, according to the described formula.

4.4.1. Computation procedure for civil servants' pensions, disability, and survivors' benefits

Computation procedure was based on profiles provided by the Ministries supervising specific civil servants for the purpose of the AWG inputs, and for each type of service and benefit the probabilities of retirement behaviours were derived. The procedure was similar for the one applied for e.g. disability fund beneficiaries.

The main features of the concept of isolation of civil servants social benefits system was described in the introduction to the chapters on isolated parts of public finances. The main methodological issue to be solved referred to the lack of social contributions, which excludes the possibility to treat the revenue side of the civil servants' system as in the case of e.g. farmers' pension and disability scheme. Nevertheless, the authors decided to assume that the amount necessary to cover the base year expenditures could be treated as "contributions". This aggregate of revenues matching the sum of expenditures in the base year was spread equally across all members of the population. In other words, we assumed that every Polish citizen contributes the same amount to the pension system of civil servants, resulting in a flat per capita of population 'contribution' profile. This can be regarded as a relatively conservative assumption since civil servants are paid from the overall revenues of the government and these revenues do not necessarily follow a flat profile.⁶⁶ Our aim was to check if the years following the base year revenues – as defined above – will be sufficient to balance the expected social assistance benefits paid to civil servants. In this respect the methodology of isolation is different from the other so far analyzed schemes, which makes comparison between the subsystems described so far more difficult. Despite this looser methodological comparability between civil servants and other schemes the authors decided to share findings of the analyses of the system, which distributed ca. PLN 11 bn of social benefits in the base year.⁶⁷

4.4.2. Generational Accounts for civil servants' social benefits system

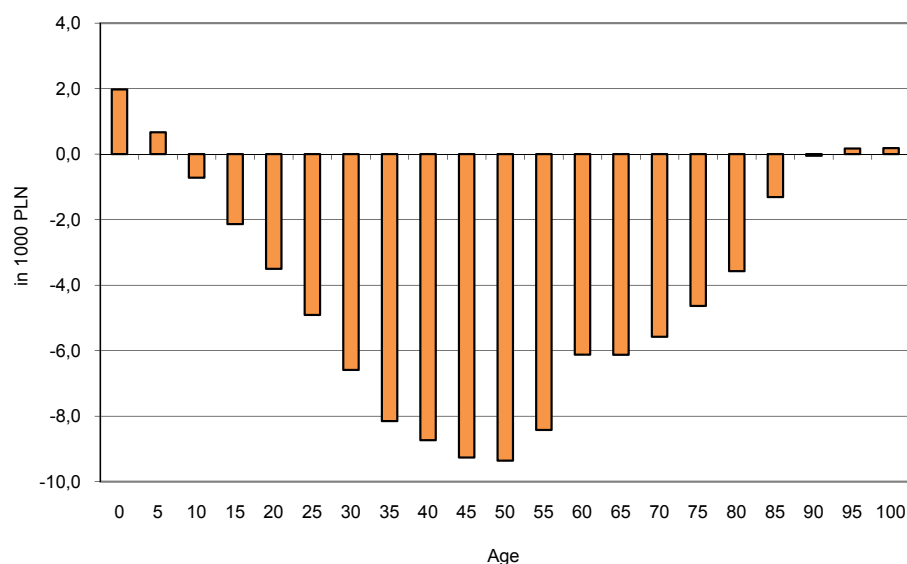
Figure 47 shows GAs for civil servants social benefits system. Bearing in mind methodological limitations of the base year revenue side, we see that despite there being no deficit in the base year, the system tends to pay much more than it 'receives' in the long

⁶⁶ For example incomes taxes are mostly paid by cohorts of the working population.

⁶⁷ Civil servant schemes generally show wave of employment. In other words due to policy changes one can observe that some years show a large increase of newly employed civil servants. As a consequence, the population of civil servants does not follow the general population structure. Due to a lack of data we could not take this into account. Future research should base on the actual population of civil servants – as it has been done for example by Benz and Hagist (2010) – in order get more precise results. Also a further differentiation of longevity of different groups assessed could improve the accuracy of our estimations. Generally, it is presumed that the life expectancy of civil servants varies considerably from the average in the population. A follow up study could take this into account – given the availability of data.

run.⁶⁸ It is also interesting, that in comparison to other pension systems, cohorts aged 50 show the highest (negative) level of GAs. In other systems such as farmers or ZUS these are the age groups of 55 years. Negative values on its own do not show whether the system analyzed is in any bad or good shape since only future net payments after the base year are taken into account. The fact that people aged 50 show the highest (negative) level of GAs is simply a result of early effective retirement ages. The system in its current pattern is relatively generous for civil servants who retire at the age of 60/65. Retirement at a statutory age gives a guaranteed pension at the level of 75% of averaged three last salaries. Just for comparison, in ZUS an average NDC/FDC pension in relation to eventual salary is estimated at a level of roughly 50% – which varies, however, by gender and birth year.⁶⁹ Our results might underestimate (life-cycle) benefits of civil servants. One reason is that we do not take into account the fact that this employee group often shows longer life expectancies than the general population.

Figure 47: Generational Accounts for civil servants social benefits system, 2007, in thousand PLN, $r=3\%$, $g=1.5\%$



Source: own calculations

In conclusion: Very long retirement period, comparable to the retirement period of miners, together with generous pension formula, yet again boosted by the ageing population process, may be the explanation of the highly unsustainable GA of civil servants.

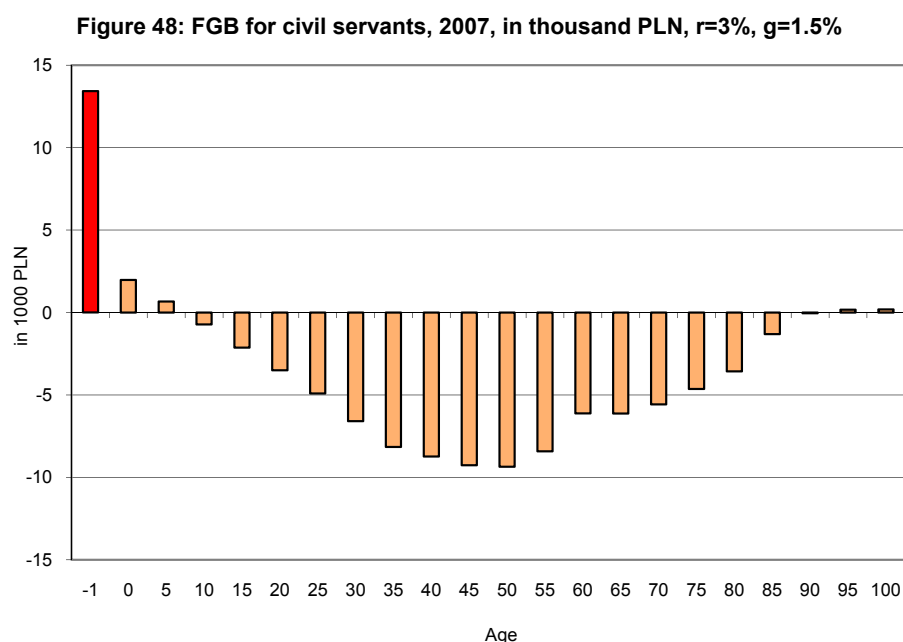
⁶⁸ Here it should be noticed that our results might underestimate (life-cycle) benefits of civil servants. Generally, it is presumed that the life expectancy of civil servants is higher than the average in the population. A follow up study could take this into account – given the availability of data. Also a further consideration of the actual civil servants' population could enhance the accuracy of results. Civil servant schemes generally show waves of employment. In other words due to policy changes one can observe that some years feature a large increase of newly employed civil servants. As a consequence, the population of civil servants does not follow the general population structure. Due to a lack of data we could not take this into account. Future research should base on the actual population of civil servants – as it has been done for example by Benz and Hagist (2010) – in order to get more precise results.

⁶⁹ See Chlon-Dominczak (2006). Of course, one could put forward in this context that relatively higher replacement rates of civil servants are offset by lower salaries and stiffer career paths in the public sector.

4.4.3. Fiscal Gaps and Sustainability Indicators for civil servants' social benefits system

The sustainability gap for civil servants amounts to 14% of GDP. Though this value is not very significant, when interpreting it we shall remember that it refers to the system which is balanced in the base year, and its participants are not in the group which deserves special attention from the point of view of state social assistance policy measures provided to persons incapable to work. Furthermore, a sustainability gap of 14% is remarkable, considering that expenditures for civil servants amount only to roughly 2% of overall government expenditures in 2008.

Our next standard indicator to be examined is the FGB in the case of isolated civil servants' scheme. The results are quite clear: if we prolong the legal status quo and maintain the per capita "contributions" to the civil servants scheme of present generations constant, a considerable intergenerational redistribution is generated. Again we want to take a closer look at a representative of future generations, a cohort member born one year after the base year (-1 year old). He/she would have to pay significantly higher net-taxes over his/her lifecycle in comparison to an individual born in the base year. The difference in GAs between these two cohorts amounts to roughly PLN 11,000. Regarding a low probability to be a civil servant, such an amount per capita seems quite significant.



Finally, we will tackle the revenue and transfer gap, our ultimate sustainability indicators. If the state intended to close the sustainability gap for civil servants with a raise of the tax inflow, this revenue side would have to be increased by 30%. A cut of 25% of benefits (of future and present generations) could respectively bridge the sustainability gap. We may conclude then the results of the computations of the isolated civil servants' social benefits system as follows:

1. Despite the fact that in our approach to isolation the system is balanced in cash terms in the base year, the long term financing of the civil servants scheme is not sustainable.

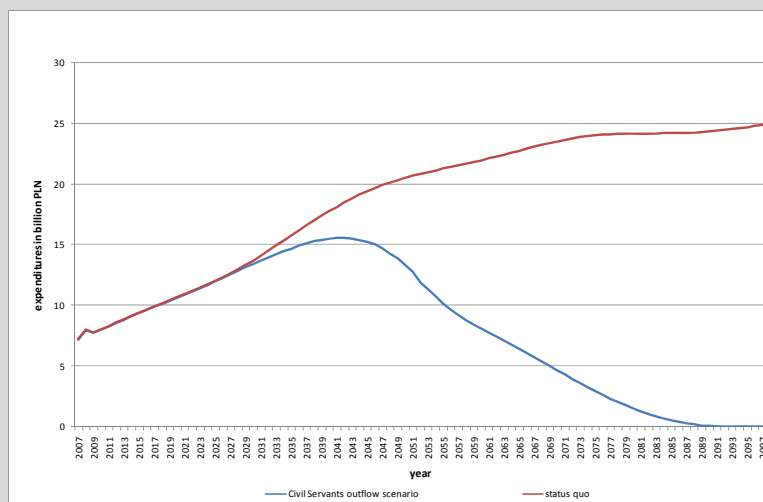
2. One of the main reasons for this long term fiscal imbalance lies in the privileges of civil servants to retire even sooner than miners, which in consequence on the average results in very long retirement periods.
3. An additional factor undermining the sustainability of this scheme is a relatively generous ratio between the final salaries and expected pension amount.
4. The proposed reform to phase out the civil servants' social benefits system and to integrate them in the general system would lead to a clear improvement of Polish long term finances (see box 3).

Box 3: Reform of the civil servants' social benefits scheme

In the recently discussed option of the reforms of the civil servants' social benefits system, the concept to hire them as standard employees was put forward, to be introduced for each new civil servant hired from 2012 onward. Following, we want to briefly sketch out the effects of such a successive phase out of the civil servants pension system and the consequential phase-in in ZUS. But first it has to be underlined that the reform computation outlined here is of a very rough nature and further data elaboration is required to ensure improved accuracy.

What had to be modelled? First, we computed an outflow of participants in the civil servants social benefits scheme. The impact of this side was relatively simple to compute. We allowed no new entrants from 2012 onwards – taking the simplifying assumption that the average age to start a civil servants career is 21 (which represents a weighted average of the uniformed services). In line with this process we let the existing civil servants and beneficiaries to keep their privileges until they die. Of course, the impact on expenditures is visible not until later years, after 2030 – as depicted in Figure 49 below. Not until this year would new entrants of the civil servants system receive any benefits without the reform.

Figure 49: Development of old age pensions expenditures for civil servants, $r=0\%$, $g=1.5\%$

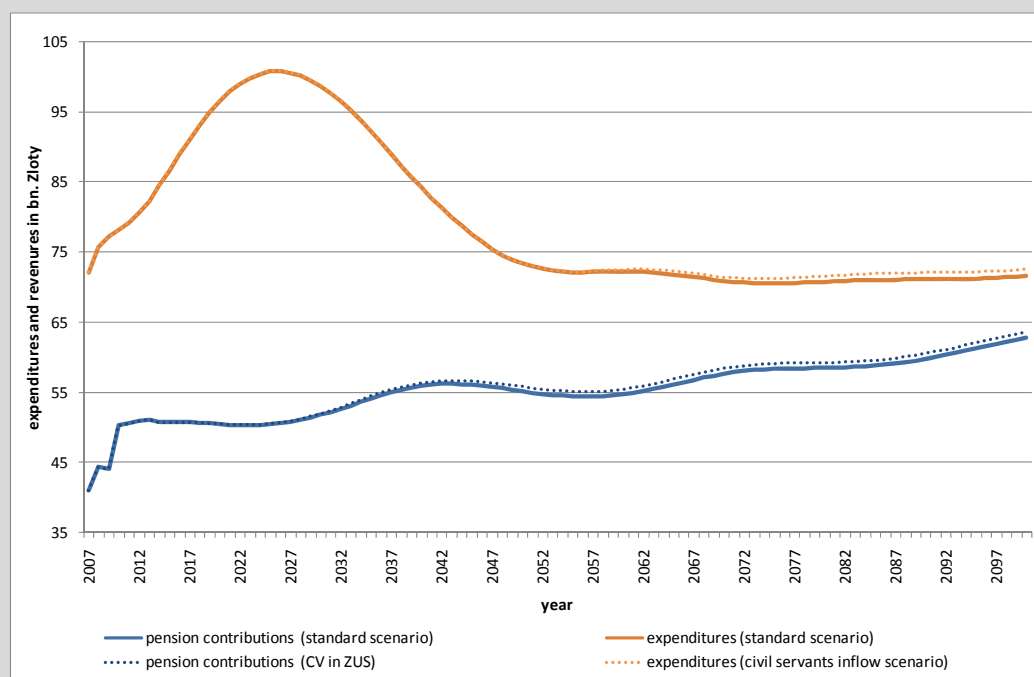


To model on the other side the inflow of civil servants into ZUS requires far more assumptions to be taken as well as data to be collected. First of all the number of new contributors entering ZUS instead of the civil servants social benefits scheme has to be estimated. Of course, this depends on future hiring policies. We adopted the assumption that a constant proportion of the population chooses to become and is hired as civil servants – which amounts to roughly one percent of each cohort. This number reflects the ratio of present active civil servants to working population. Furthermore, the social contributions basis has to be estimated. Here first of all the average level of salaries for different groups of civil servants should be gathered. Additionally, it has to be decided whether these salaries are increased due to the reform. Here two options are imaginable:

- gross salary (e.g. soldier's pay) corrected for growth until 2012 (starting year of the reform) – which in consequence would decrease significantly the civil servants' salaries and as a result, certainly cause social and political tensions;
- gross salary increased by the amount of social insurance burden: so in addition to current level of gross salaries a civil servant would receive from the state additional reimbursement of the social contributions paid to the NDC.

Due to restrictions of data and resources we took the assumption that civil servants entering ZUS have a salary comparably to the average of ZUS contributors. Of course, this is simplified approach and therefore the results of this exercise should be taken with cautiousness, e.g. according to our estimates the average salaries of judges are well above 250% of the average salary in the economy. With the reform civil servants are treated like common ZUS contributors. In other words, NDC accounts are applied and also the same retirement probabilities are considered. Of course, in this outflow scenario the probability to be a ZUS contributor changes – but only rather gradually: every year (from 2012 onwards) one more cohort is not entering the civil servants social benefits scheme but ZUS instead. But not until 2055 will all active civil servants be members of ZUS. This explains why the impact on the contribution side of ZUS is only clearly visible after 2040 –see the following Figure:

Figure 50: Development expenditures/revenues inflow of civil servants into ZUS, $r=0\%$, $g=1.5\%$



According to our very rough estimates the savings for general government are nevertheless substantial: the sustainability gap would decrease from 228% to 210% of GDP in the case of the proposed reform. But it has to be underlined that the accuracy of results can be clearly improved. Future research should apply e.g. more precise data on the number of working civil servants and their actual wages and compute different scenarios such as: 1) constant and 2) increased gross salary (by social contributions) of civil servants.

4.5. The healthcare system

Historically, the state budget was responsible for the provision of healthcare services in Poland. After the introduction of the healthcare reform in 1999 the structure of healthcare financing has changed:

- National Healthcare Fund (NFZ) - the government self-financing entity, developed in a few organisational stages, is responsible for contracting the healthcare services with public healthcare units.
- Central government provides healthcare oriented programmes and local governments finance the operational costs of public healthcare units at local level.

The NFZ budget plan has to be balanced by law. The main source of financing of NFZ expenditures are healthcare contributions. But there are other revenues as well:

- Revenues from the state government for tasks commissioned by the state budget in respect of the governmental health programmes;
- healthcare contributions (in fact state budget transfers) for: unemployed persons, beneficiaries of maternity leave, and additionally for farmers, rerouted via KRUS.

In the case of already analysed isolated subsystems, e.g. disability fund, the amount of the state budget support depends on the discretionary decision of the government. The part of contributions transmitted to the NFZ paid by the state budget, and not directly by the contributors, was treated separately from 'normal' NFZ-contributions.⁷⁰

The overall amount of healthcare expenditures of the NFZ amounted to 40 bn in 2007. Additionally, state budget expenditures amounted to almost 5 bn, of which 2.5 bn on healthcare contributions paid to e.g. farmers and unemployed persons, transferred to NFZ. The remaining 2.5 bn of the state budget expenditures were spent mainly on capital investments in hospitals, public blood service, professional medicine, government healthcare and prevention programmes as well as medical education. Local government expenditures amounted to around 3 bn, half of which was spent on maintenance costs of the hospitals. All COFOG healthcare expenditures in 2007 amounted to around 54 bn, of which 41 bn were broken into micro-profiles, and covered in our computations. The remaining 13 bn cover to some extent the LTC expenditures, and definitely call for improvement of the computations.⁷¹

4.5.1. Computation procedure for the healthcare system

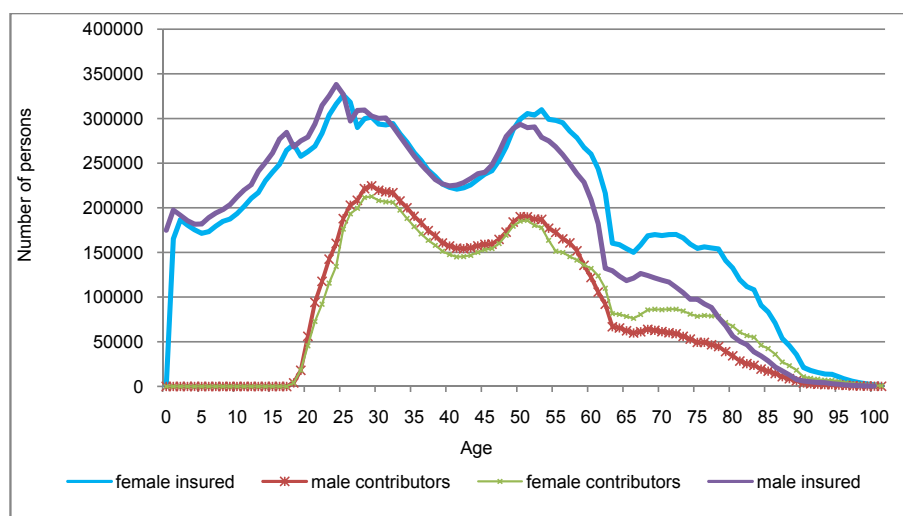
The number of insured persons in the NFZ in some cohorts exceeds the number of population size. The obligatory healthcare insurance is provided to all social groups so apart from contributors the healthcare insurance is extended to the members of the contributor's family, who do not have taxable sources of income, e.g. children. In our approach to isolation we decided to verify if the system is sustainable with support of actual contributors and the base year state budget support. The only micro profile available on the healthcare system contributors was provided by ZUS, which transmits the healthcare contributions to NFZ for ZUS contributors. The number of retired contributors was estimated on the basis of an old age-pension micro-profile provided by ZUS. According to our estimates the relation of the number of healthcare contributors to the number of persons insured in the NFZ amounts to 46%.

The amounts of healthcare contributions for the working population was derived from the age and gender specific gross income micro-profile, which has already served as a starting point for our NDC pension calculation. Healthcare contributions are paid obligatorily by all working individuals on the basis of taxable income (gross income after the deduction⁷² of social

⁷⁰ Similar to the tax inflow in the civil servants' social benefits system we assumed here a flat revenue-profile. In other words, the relatively little inflow of state budget support to NFZ (2.5 bn, in 2007) was spread equally over all age groups of the Polish population.

⁷¹ For the remaining part of health care expenditures we assumed – due to a lack of age specific micro data – a flat profile. We presume that this will lead to a considerable underestimation of implicit liabilities in the public health care sector.

⁷² In case of pensioners the basis for calculation of healthcare contributions is gross pension (if it's the only source of income of a pensioner). Social insurance burden is in principle not imposed on pensions. In consequence, the average effective healthcare contribution rate for pensioners is higher as well than the one estimated for working population salaries.

Figure 51: Number of insured persons and actual healthcare contributors, 2007

Source: NFZ, ZUS and own calculations

insurance contributions). In consequence, for the working population and pensioners (excluding farmers) the nominal healthcare contribution rate is set at the level of 9%, but the effective rate amounted to around 7% of the average gross income in the base year. Due to lowered disability contribution rates paid to ZUS, the average effective healthcare contribution rates increased slightly. According to our estimates, in the base year the working population paid contributions to the NFZ amounting to around 34 bn, and pensioners nearly 6 bn. As a source of data for healthcare contributions paid by ZUS beneficiaries we took the average (age and gender specific) pensions, disability benefits and survivors' benefits. Different effective healthcare contribution rates were applied accordingly, since pensions are not a basis of social contributions' burden, so the effective healthcare rates are slightly higher than those of the working population⁷³. Nevertheless, one has to bear in mind that we applied effective rates based on 'old' PIT rates, which certainly biases our results. Our estimates of NFZ revenues from different groups of population are shown in Table 3:

Table 3: NFZ revenues for different groups of the population, 2007, in billion PLN

NFZ work	34,5
NFZ pensions	3,2
NFZ disability	1,3
NFZ survivors	1,4
total NFZ	40,3

Source: own calculations

The healthcare expenditures were divided into several categories,: hospital treatment (18.6 bn), basic medical healthcare (4.7 bn), specialized ambulatory care (3.1 bn), dental treatment (1.3 bn), medical specialist services (1.0 bn), and long term care (LTC) (0.7 bn).

The micro profiles for particular healthcare categories were created as follows:

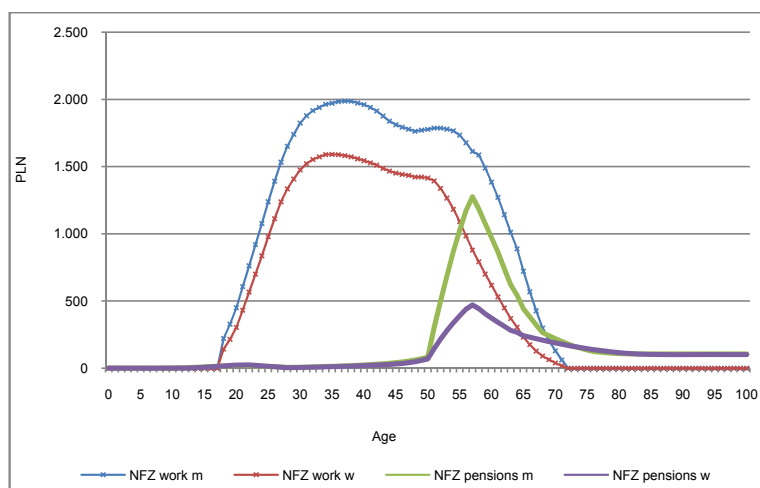
We used the households survey on healthcare spending (CSO, 2006), annual report of the NFZ (2006, 2007, 2008, NFZ), and source data provided upon request by NFZ on the average per capita cost of selected categories of healthcare treatment. Statistical survey on

⁷³ This is not very precise expression, since we applied effective PIT rates based on average of 3 existing taxation rates in 2007 (19%, 30% and 40%). According to our estimates, the PIT revenues based on these rates cover only 72% of all tax payers, defined here as working population. Our effective rates do not take the remaining part into consideration.

healthcare served as a source of information on the number of patients for each type of healthcare treatment, e.g. for each type of treatment the age and gender specific multi-annual cohorts from the survey were divided into one-year cohorts, assuming they are representative for the respective cohorts of the entire population.

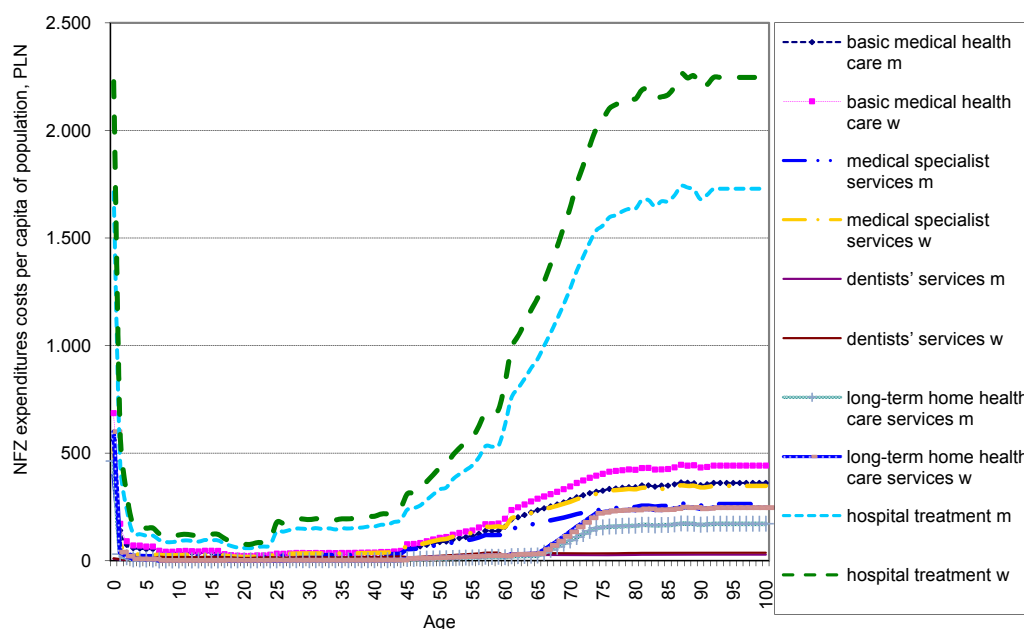
For cohort specific cost the dynamics of per patient costs was created on the basis of data provided by the NFZ. Then, the received growth was applied for each type of healthcare treatment costs⁷⁴.

Figure 52: Healthcare contributions per capita of population, 2007, PLN



Source: own calculations

Figure 53: NFZ expenditures costs per capita of population, 2007, PLN



Source: own calculations

⁷⁴ Average per patient treatment varies for each type of service, per patient cost in 2007: hospital treatment (4710PLN), outpatient LTC (2165PLN), specialised medical consultations (419PLN), basic medical care (310PLN), dental services (210PLN); source: own calculations.

As stated in the chapter on assumptions and data, the micro-profiles of healthcare expenditures in Poland follow, in general, the patterns of comparable profiles in OECD countries⁷⁵. In comparison to AWG2009⁷⁶ our profile for Poland seems steeper. Another important feature is the proportion of hospital treatment to the sum of total healthcare costs: in the case of Poland this share amounts to almost 47% in the base year and is the mostly dominant category of all types of costs of medical care. Putting together the two abovementioned observations, it becomes clear that hospital treatment of elderly people represents a large proportion of present health care expenditures. Bearing in mind the growing share of older persons in the Polish society in the coming decades we can expect a significant raise in healthcare and especially in hospital treatment expenditures.

4.5.2. Generational Accounts for the NFZ

The authors are well aware of the uncertainty about future healthcare expenditures. This regards especially our assumption of a constant health care profile over time (see box 4). Therefore, the following results should be taken with a touch of caution.

Box 4: Constant age-specific profiles – a reasonable assumption?⁷⁷

A crucial assumption of the analysis is that the age-specific distribution of (public) healthcare expenditure per capita remains constant over time. In the following we will call this the status quo hypothesis. However, economic literature in this field is relatively controversial. Mainly, there are two contradicting hypotheses regarding the outcome of the age specific distribution when life expectancy of the old population (60 years and more) increases. The first one is the so-called *medicalization hypothesis* which goes back to Verbrugge (1984). In this scenario, due to the observed multi-morbidity of elderly patients, certain treatments (e.g. for heart diseases) prolong the life without restoring the health of the patient fully. This leads to further treatment in the case of another disease. As a result, it induces a “steepening” of the age-specific health expenditure profile with an increasing life expectancy controlling for the effect of medical-technical progress. In this case we would underestimate the demographic effect on the growth of public health care expenditure because we would neglect this shift with our assumption of constant profiles. The other scenario is the so-called *compression hypothesis* which was first formulated by Fries (1980). Under this scenario, observed differences in health expenditure per capita in different age groups are not due to the calendar age but to the remaining lifetime to death. Old cohorts simply cost more because they are more likely to die and not because they are old per se. If the life expectancy of the elderly increases, the costs which they will cause will just be shifted into the future, controlled for the effect of the medical-technical progress. The age-specific distribution would become flatter over time. In this case, we would overestimate the demographic effect on the growth of governmental outlays on health. Both hypotheses are controversial and both lack sufficient empirical evidence. Fetzner (2006) has shown that in the case of Germany, the results of a *Generational Accounting* analysis are not strongly influenced by the choice of the underlying scenario with differences of 8.8 percentage points between the *compression* and *status quo hypothesis* and 25.5 percentage points between the *status quo* and *medicalization hypothesis* regarding the *sustainability gap*. To summarize: applying the *status quo hypothesis*, i.e. the assumption of constant age-specific profiles of health expenditure to forecast future health care outlays or to calculate *Generational Accounts* is connected with a great deal of uncertainty. However, as long as evidence is mixed, it seems to be a reasonable assumption and a suitable approximation for current research.

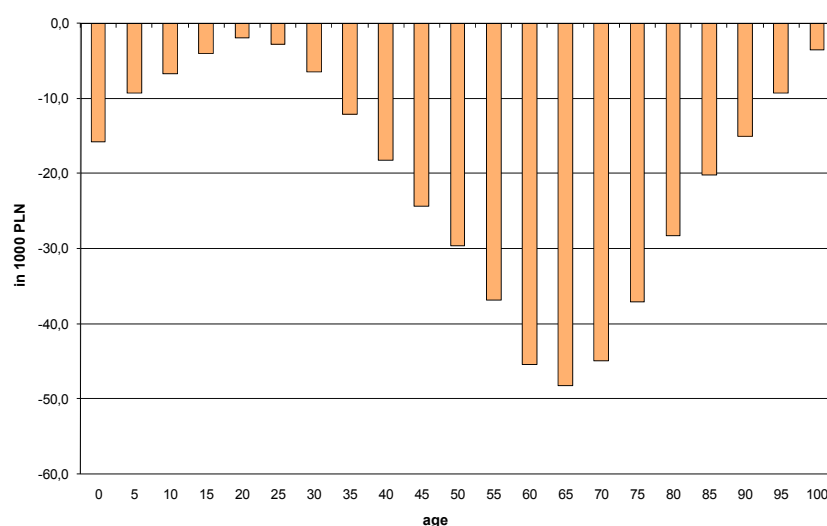
⁷⁵ See Hagist (2008).

⁷⁶ See Ageing Report 2009, European Commission.

⁷⁷ This description bases to a large extent on the work of Hagist (2008).

First of all Figure 54 shows isolated GAs for NFZ healthcare the in base year in the standard scenario (*status quo*), and it gives a pretty sobering impression. All newborns receive the starting package of medical services mostly in hospital, so the probability to be its beneficiary is relatively high at this age. The cohorts who are expected to contribute to the system almost as much as get back (over their remaining life cycle), are those aged between 15 and 25. At first sight it might be surprising, that already cohorts aged 30 are receiving more than cohorts aged 15-25. Here it has to be underlined that generational accounts observe cohorts over their remaining life cycle. In other words the probability that cohorts aged 30 today will feature increasing health costs when getting older is taken here already into account.⁷⁸ This explains higher negative value of population aged 30, than those aged 15. Of course, generational accounts drop further – here until the age of 65 – due to the fact that health expenditures (contributions) increase (decrease) with age. After the age of 65 GAs rise up again mainly due to increasing mortality – which lowers the probability to receive relatively high benefits at ages 65+. But of course, this is also due to the fact that only future revenues and benefits are taken into account. So e.g. for a 90 year only medical expenses over his/her relatively short remaining life cycle are considered in the GAs.

Figure 54: Generational Accounts for NFZ, $g=1.5\%$, $r=3.0\%$, 2007, in thousand PLN



Source: own calculations

The next Figure 54 shows GA with additional reference to cost pressure. In this scenario we assume that the growth of health care expenditures per capita is higher than GDP growth per capita. For a background of this scenario see box 5. If this scenario turned into reality, then all cohorts would go on much deeper to the 'dark side': even relatively well performing young and healthy 20-25 years' old contributors shall become net recipients of the healthcare system for the amount of over PLN 20,000. The older the cohorts become, the smaller the impact of the cost pressure that can be spotted due to a shorter remaining lifetime period.

⁷⁸ Of course, due to discounting – or more precisely due to the residual of discount and growth rate amounting to above zero – the further we step away from the base year the less do future net-tax payments play a role for value of generational accounts. Hence for the 30 year old in the base year his/her health care expenditures in 50 years, being then 80, are of minor importance for the value of generational account of the today.

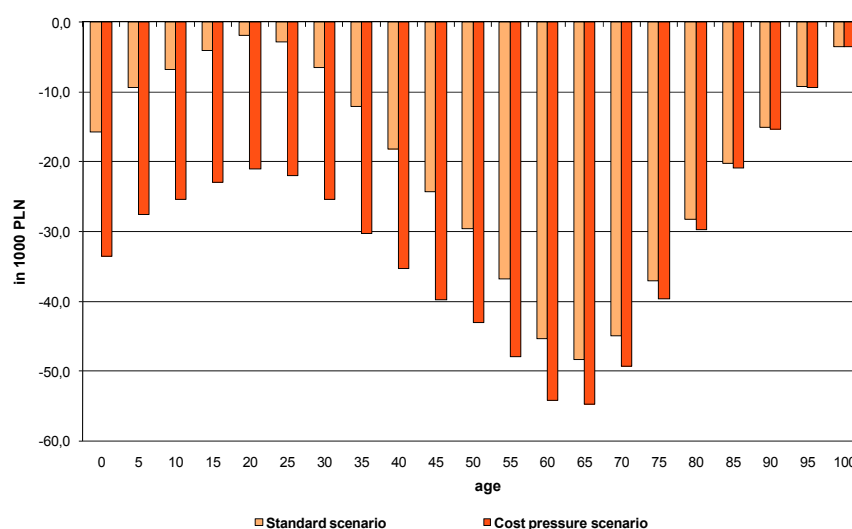
Box 5: The scenario of medical-technical progress

Current literature reveals that the rise in health care expenditures can only partly be attributed to the ageing process, see e.g. Dormont et al. (2006). Some research such as Breyer und Ulrich (2000) show that it is also determined by the so called *medical-technical progress*. This judgment is based on the assumption that innovations occurring in the health care sector are relatively one-sided. Generally it is assumed that costly product innovations dominate cost-saving process innovations.⁷⁹ The ensuing effect is that the healthcare system is able to offer new, and often costly methods and tools to cure diseases. However, due to a lack of process innovations it is lagging behind the efficiency of other sectors in the economy. As a result (per capita) health care expenditures tend to grow at a faster pace than the general productivity growth. Breyer und Ulrich (2000) estimate for Germany a growth-differential of 1 %. Hagist and Kottlikoff (2009) calculate for 10 OECD countries a growth differential of at least 1 % for each country.

For our computations in the *medical-technical progress scenario* – also called *cost pressure scenario* – we assume a growth of medical expenses per capita of one percent above the general economic growth. However, we limit this higher growth path until the year 2040. After this point in time health care expenditures follow our standard growth assumptions in the long run. The rationale for this time limit is a logical one: If we were not to limit the higher growth path, health care expenditures would outweigh the Polish GDP in the long run.

In fact, the GAs with cost pressure give the most grim sustainability perspective of all the so far analysed isolated subsystems in absolute terms. What may worry policy makers even more is the fact that in comparison to the ‘cash deficit’ in the base year of e.g. other already isolated sub-systems, e.g. farmers pension and disability fund (93%) or ZUS disability fund (41%), the NFZ is actually balanced, but for a small part of contributions paid from the budget. It becomes clear that policy makers will most probably have to decide in the coming decades between a rise of health care revenues – via higher contribution rates and/or extra budget funding– and further reform measures to close the fiscal gaps.⁸⁰

Figure 55: Generational Accounts for NFZ with additional cost pressure scenario, $g=1.5\%$, $r=3.0\%$, 2007



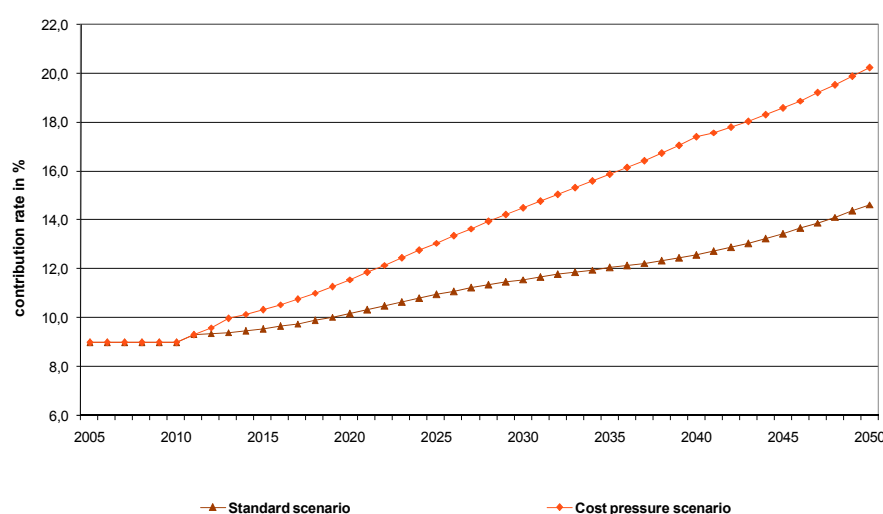
Source: own calculations

⁷⁹ See Zweifel (2003).

⁸⁰ Recent research see e.g. Garber and Skinner (2008), has shown that an advancement of cost-benefit measurement can be one valuable tool to improve the allocative and productive efficiency in the health care sector.

Additionally, we want to present indicators showing how revenues/transfers have to be changed in order to close the sustainability gap. Being this a rather theoretical and reference possibility, the healthcare services contracted by NFZ with public healthcare units would have to be reduced by 26% in the standard scenario or 43% in the cost pressure scenario. In addition, we calculated the necessary change in nominal healthcare contribution rate, which would guarantee NFZ sustainability, as plotted in Figure 58. So, in the standard scenario the raise of the contribution rate required to close the sustainability gap would lead to an increase of nominal rates from the current 9% to 12% in 2035, and almost 15% in 2050. Not surprisingly, with faster-than-GDP pace of growth of the healthcare costs, the contribution rates would have to be doubled in 2042, and will keep growing to over 20% in 2050.

Figure 58: Development of healthcare contribution rate closing sustainability gap, 2007, $g=1.5\%$, $r=3\%$



Source: own calculations

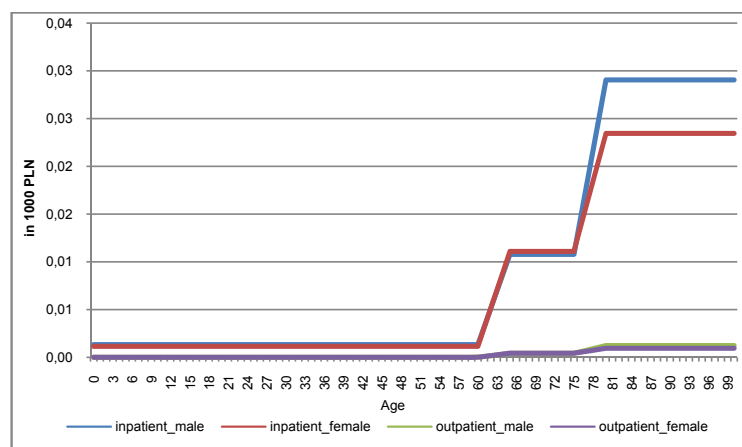
Before we summarize our results a few remarks shall be made regarding the LTC data. Our input data for LTC refer only to the part of the LTC care in Poland paid from the NFZ, amounting to a rather insignificant amount of 0.7 bn. In addition to the out- and in-patient services there are more LTC services provided by several local government institutions, for the amount of around 4 bn. These inputs are not considered in our computations due to the lack of source data. Comparing to all other types of healthcare services represented by the NFZ expenditures, the in-patient LTC is the smallest category, but on the other side, the profile of costs between consecutive cohorts, aged 60/65 and over, is even steeper than in the case of e.g. hospital treatment. According to our findings, the in-patient LTC seems to increase the health care expenditures more than other forms of healthcare treatment. From the point of view of the obtained results we suppose that the inclusion of the mentioned missing 4 bn into the in-patient profile would significantly increase sustainability gaps.⁸¹ So far these costs are considered in the residual profile for other types of healthcare services, with flat per capita cost. Hence, our calculations can be regarded in this sense as relatively conservative. In addition to this observation we could expect that governmental programmes, which aim at increasing the range of in-patient care provided by the state (now provided in

⁸¹ If we include these missing 4bn into the in-patient profile the outcomes of the fiscal gap increase by roughly 18%.

principle by the families) will have to be carefully examined in terms of respective financing. Further research could examine the fiscal impact of a rise of in-patient care to the EU-average. In 2007 only 0.6% of elderly people (aged 60+) have been cared for in nursing homes in Poland. Other EU-countries such as Sweden (7.2%), Netherlands (5%) or Spain (3.4%) showed significantly higher levels. One explanation of these differences lies in the older population of EU15 countries. Incidence probabilities of LTC usually increase with age. So there are simply more very old individuals (aged 75+) who are more likely to be in the LTC. But also the relatively low ratios of working population to very old population (75+) in Western countries can explain the high proportion of in-patient LTC. There are simply fewer young cohorts to care for their relatives at home. With the significant rise of the old-age dependency ratio in Poland one can therefore expect also a convergence to the EU level of in-patient LTC. Additionally, the probability to be cared for at home in Poland can be affected by social changes. With higher female participation rates and higher divorce rates or increase in single person households one can expect that fewer people care for their relatives at home, which could additionally increase the nursing home care. But of course, also the changes of the legal framework will determine the development of the future LTC in Poland.

4

Figure 59: Development of long term care profiles, per capita, 2006



Source: own calculations on basis of the OECD data (2006)

The initial conclusion of our examination of the isolated NFZ sub-system may be summarized as follows:

1. Despite a balanced budget in the base year the system of provision of healthcare services tends to be one of the most unsustainable of all analysed, isolated subsystems.
2. The main reason for the significant sustainability gap is the combined effect of health care profiles increasing steeply with age and the ageing population process. Additionally, cost pressure induced by medical-technical progress can have a considerable impact on fiscal sustainability.
3. LTC can be a potential source of growing costs in the case of higher participation of governmental programmes in this field. Further research should focus more on this increasingly important part of public finances.
4. Better availability of the source data would significantly improve the precision of computation. Also a closer comparison and exchange of data and assumptions taken in the AWG estimations is highly recommended.

4.6. Education

The system of education in Poland was founded in its current shape in accordance to the educational reform of 1999. Youngsters after kindergartens, which last from the age of three to the age of six, enter the primary schools (for six years) and then the junior high schools (for three years). From age of 16 the secondary education starts in three-year general lyceums or in vocational specialized lyceums (these are dramatically loosing new entrants) as well as four-year long secondary technical schools. The certificate of secondary education, issued after the secondary school-leaving exam, permits to access higher education. There is a possibility to graduate after two or three years from basic vocational schools that teach selected craftsmanship professions. The basic vocational schools do not give access to higher education. The graduates of these schools may continue their education in a complementary lyceum or a complementary technical secondary school. After having graduated in one of these two, the secondary school-leaving exam completion allows to enter the higher education level.

In 2007 all expenditures on education amounted to over 66 bn, according to COFOG methodology. State budget expenditures amounted to 45 bn, of which almost 31 bn were financed from the state budget subsidies to local government. Expenditures from the local budgets on education amounted to 22 bn. In fact, the financing of the primary and secondary education system is carried out by local governments.

Higher education starts most often at the age of 19 and lasts in most cases for 5 years. The system consists of public and privately owned universities and higher professional schools. General government expenditures on tertiary education amounted to almost 19 bn. Some revenues of public universities were earned from own activities.⁸² As stated in the chapter devoted to data, assumptions [and computation procedures], due to the high share of persons aged over 19 in the complementary educational system, two separate profiles for education were elaborated, reflecting merged primary and secondary education, and separately higher education.

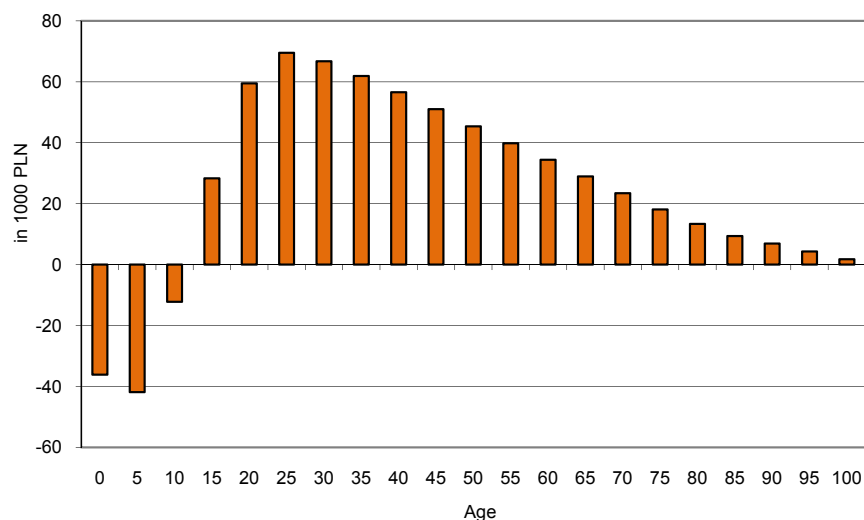
Input data for education was prepared on the same basis as civil servants, where in the base year the revenues were set exactly at a level to balance expenditures. Aggregate numbers for expenditures (and consequently revenues) were based on COFOG education expenditures in general government.

4.6.1. Generational Accounts for education

Figure 60 depicts the GA for education in Poland. The picture looks as one would expect: younger cohorts are net-beneficiaries of the education system. Similar to e.g. the pension system, education is based on a generational contract, which is reversed, however, with respect to the common “agreement” between generations. Here the older cohorts are paying for younger ones. It is interesting that already cohorts aged 15 are net-tax payers. Of course, this is due to the fact that we observe all age groups over their remaining life cycle. So also future relatively high tax payments, i.e. “contributions” to the education system are taken into account.⁸³ All cohorts aged over 25 who on average finished their education, contribute (net) extensively to the education system.

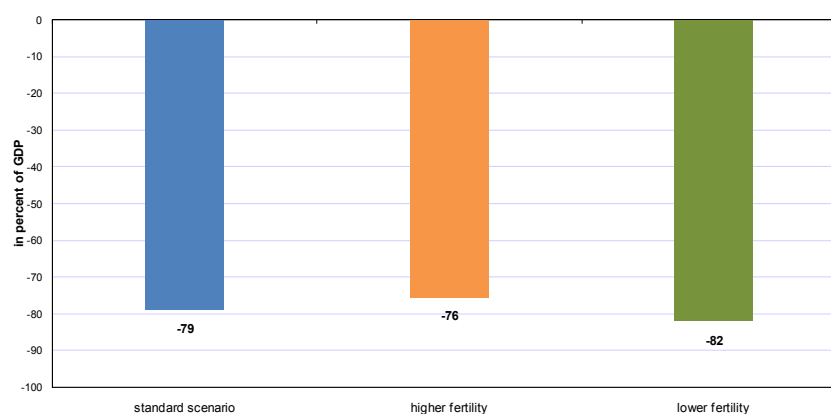
⁸² As in the case of civil servants we apply here a flat tax profile. Of course, for some part of revenues, namely university fees, such a flat profile represents a simplification. But since university fees stand only for a very minor part of total revenues we consider that the loss in accuracy of our approach is negligible.

⁸³ But of course it plays also a role that an average Pole has a relatively high probability to profit from primary and secondary education, while the probability to benefit from higher education is relatively smaller.

Figure 60: Generational Accounts for education, 2007, in thousand PLN, $r=3\%$, $g=1.5\%$ 

Source: own calculations

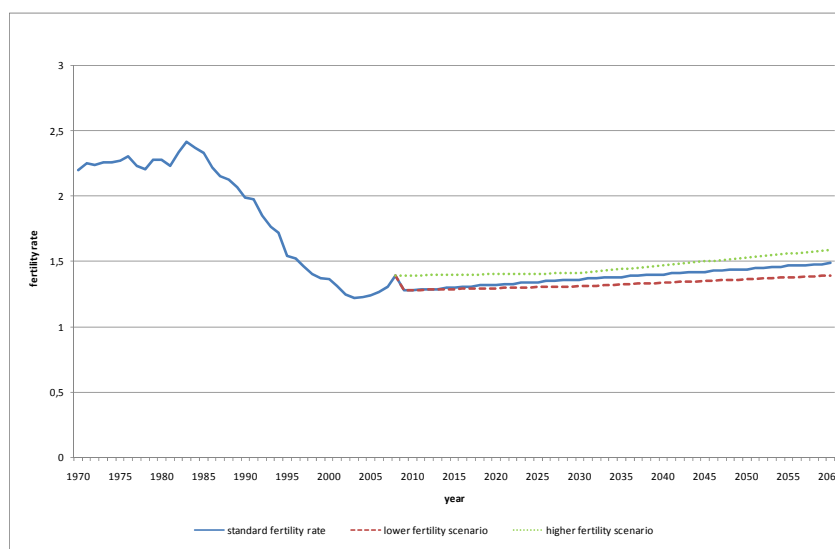
On its own, Figure 60 does not give any indication of sustainability or lack of it. For such an assessment we have to take into account cohort sizes. In other words, it has to be examined how many net-beneficiaries correspond to the relevant number of net-taxpayers. Knowing the expected demographic development, the outlook for the Polish education system is quite bright – in fiscal terms. If present per capita costs and revenues of the education system remained constant over time considerable assets or savings could be generated. For the standard demographic scenario they would amount to about 79% of GDP (in present value) see Figure 61. Of course, one could argue that in comparison to other fiscal systems future education expenditures are highly sensitive to assumptions on fertility. While e.g. future old age pensioners of the coming six decades are already alive and therefore countable today, this is not the case for future pupils. But – as Figure 61 outlines – even when assuming significantly higher/lower fertility rates outcomes are relatively stable in qualitative and quantitative terms.

Figure 61: Sustainability gap for education, different fertility scenarios, 2007, $r=3\%$, $g=1.5\%$ 

Source: own calculations

In other words, if revenues from the base year were left unchanged overtime, in the following years the education system would have significantly more resources for providing its services. The reason for this expected surplus of the system lies in demographic changes. Due to the decreasing fertility rate, which started after the baby boomers period of the 80's, the following generations who start their education, are becoming less numerous – see the following Figure 62:

Figure 62: Different fertility rate options



Source: own calculations

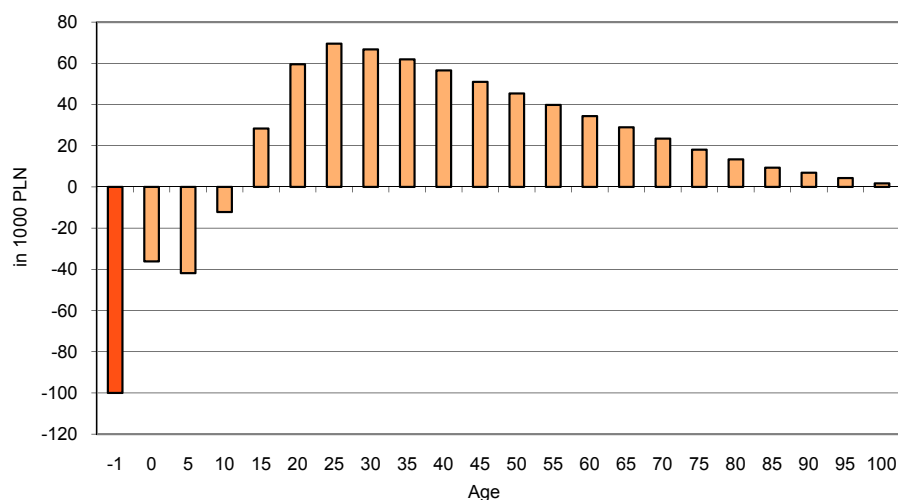
The systemic financial requirements, and probably the infrastructure as well, decreases, if we assumed unchanged costs per pupil. Under this assumption combined with the presumption to keep the present per capita revenues constant in the long term, the education system generates a considerable surplus. Certainly, a cost analysis should follow to verify to which extent the cost of education remains adequate in relation to expected effects. It may happen that the expected savings in the education system could be used for higher expenditure per pupil to meet the expected educational standards. Nevertheless, it seems that at least a re-allocation of sources shall be envisaged towards higher per capita spending for educational purposes, since the level of overfunding is significant.⁸⁴ Concluding, the message from our exercise sent to policy makers and local governments seems clear: considerable savings in the education system can be expected due to demographic changes. How these future assets shall be allocated in the system of public finances, has to be decided by politicians. Recent research, however, indicates that it is advisable to use some part of the “demographic asset” for higher education spending.

⁸⁴ Different authors such as Barro (2001) indicate that a higher spending on education can generate significant productivity gains and growth effects. Furthermore, recent literature such as Leifels and Vatter (2010) underlines that future public finances can profit considerable from present spending on education. Here especially public health care and unemployment insurances benefit from the gains of education since they are generally not based on the principle of equivalence. Other social security systems like the pension system profit less from future productivity gains and accompanying income increases. The rationale is clear: higher income, i.e. higher contributions to the pension system, translate in higher pensions.

4.6.2. Fiscal Gaps and Sustainability Indicators for education

Other sustainability indicators confirm the initial observations about the direction of financing in the educational system. Contrary to almost all analyzed isolated sub-systems, the educational system, with its current financing requirements unchanged, creates a significant sustainability surplus, amounting to almost 80% of GDP. Translated into FGB, a representative of the future generations born one year after the base year is considerably better off than its counterpart of the base year by roughly PLN 60,000. Hence, if for all present generations the financing structure of the education system remains unchanged, we create a large intergenerational redistribution. But here it goes in a different direction: we are passing not a burden but an asset to future generations.

Figure 63: FGB for education, 2007, in thousand PLN, $r=3\%$, $g=1,5\%$



Source: own calculations

5. The sustainability analysis of the entire public finances

This chapter illustrates the outcomes for the entire Polish general government. After having analyzed selected isolated sub-systems of the age-related categories of public finances, we follow with the 'big picture'. So, are Polish public finances stable in the long term? Can assets of one sub-system outweigh the liabilities of other public finance systems? With the following passages we intend to answer these questions.

In the budgetary year 2007 a few important systemic reforms were continued, which could have an important influence on our long term projections. Some of them were already taken into account and described in the results of the isolated computations:

- disability contributions rate lowered in a few stages,
- 'walking changeover' of the old pension provision system into NDC-based pension scheme.

Additionally to the above-mentioned processes, in 2009 new personal income tax rates were introduced: instead of steeply progressing three rates of 19%, 30% and 40%, two new rates were introduced: 18% and 32%. Due to the timeline of computations of the current version of the GA, the consequences of tax rate changes were introduced only into the computations in the form of reduced aggregated revenues – based on the preliminary state budget reports on tax revenues from 2009.⁸⁵ Finally, interest payments and EU flows were excluded from the dataset, accordingly to the standard methodology of the GA.

The effects of the business cycle were not taken into consideration. The reason for the lack of smoothened cyclical budgetary items in our computations is the quality of micro-profiles as well as the inconsistency of assumptions between the GA model and the available data on the cyclically adjusted deficit.⁸⁶ For taxes and unemployment benefits we used the most up-to-date aggregate data from the year 2009. In this year one can already observe the economic downturn in the budget data. Therefore, we might overestimate the fiscal gap by projecting 2009 data into the future without a smoothening of the business cycle. The authors decided to postpone the adjustment of the dataset to business cycle until an update of the paper.

5.1. Generational Accounts for Poland

Figure 64 shows GAs for Poland. The sinusoidal shape⁸⁷ of the chart is comparable to other (GA) country studies. Each column presents the net financial position of the respective cohort. In other words, it considers all fiscal contributions and taxes paid as well as all transfers received from the general government of an average individual over his/her remaining lifecycle.⁸⁸ The youngest cohorts here are net recipients. In other words, a

⁸⁵ Input data on PIT micro-profiles from the base year are left unchanged. Some less important changes introduced in taxation system (VAT, excise, etc.) took place, but these were taken into consideration in the form of the aggregates for 2009, while their profiles remained unchanged. In order to adjust the dataset to the recent development of the fiscal situation, the whole set of 2008 aggregates and selected items for 2009 were introduced to the inputs. Therefore, the micro-profiles for: PIT, VAT, social contributions and all types of pension benefits paid by ZUS were rescaled to the 2009 preliminary aggregates.

⁸⁶ From the perspective of model inputs, the micro-profiles for taxes and unemployment benefits were created on the basis of statistical surveys, which miss the precision of 'raw' source data. These 'raw' data were derived from only slightly modified aggregation of accounting figures, provided by e.g. ZUS or KRUS. Secondly, the available data on cyclically adjusted deficit for Poland (NBP estimates) were based on different economic assumptions on the growth forecast in the coming years, higher and volatile comparing to our flat 1,5% in real terms. Facing the serious risk of having misleading results, the authors decided to postpone the adjustment of the dataset to business cycle until an update of the paper.

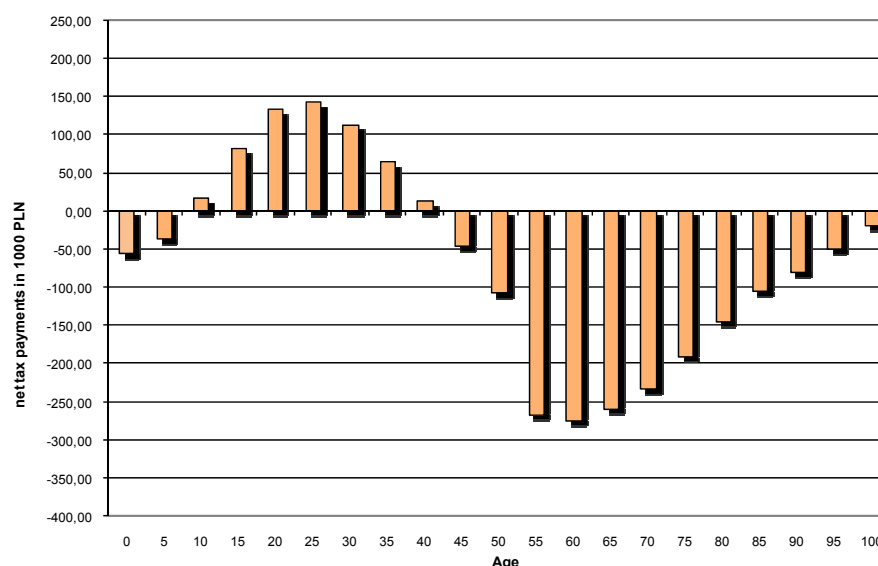
⁸⁷ The shape results from the expected economic activity of the individuals. Young cohorts of working population have yet many years of job activity, whilst the elderly part of the society has mainly retirement periods ahead. An additional factor, which plays a role is the discount factor.

⁸⁸ All GAs are stated in present value.

newborn Pole gets more benefits (over his/her remaining lifecycle) than he/she pays contributions and taxes. For each subsequent cohort the expected cost/benefit structure changes. The generation, which (in net terms) contributes the most (over its remaining life cycle) is aged 25 in 2007. The turning point, where the tax and contribution payments are balanced by transfers received, is recorded for the age group of 40 year olds. “Top (net) beneficiaries” are persons aged 55 to 60. Their present value of net transfers to be received amounted in 2007 to nearly PLN 280,000. It is important to stress that the GAs between cohorts – shown in Figure 64– are not comparable, since each following cohort, starting from the base year newborns, has a shorter remaining lifetime. In other words, only in the case of the zero year old the entire (expected) life cycle is taken into account.

Again, on its own the GAs do not indicate whether the fiscal system is in any good or bad shape. Only when weighting the GAs with the demographic structure one can draw conclusions about the long-term stability of public finances. This further step is taken in the following passages.

Figure 64: Generational Accounts for Poland, $g=1.5\%$, $r=3.0\%$, 2007



Source: own calculations

5.2. Fiscal gaps and sustainability indicators for Poland

In the following chapter it will become clear that the explicit debt of 45% in the base year is only the “top of the iceberg” of the Polish government debts. In fact, the current fiscal policy bears an additional implicit debt of about four times the explicit debt of the base year GDP (183%). This amount is generated when weighting the GAs of present⁸⁹ and future generations with the respective cohort sizes.⁹⁰ Overall the sustainability gap of Poland amounts to 228% of GDP in 2007 – including the explicit and the implicit debt⁹¹. The message is clear and could have been somehow expected after a series of adverse results

⁸⁹ See Figure 64.

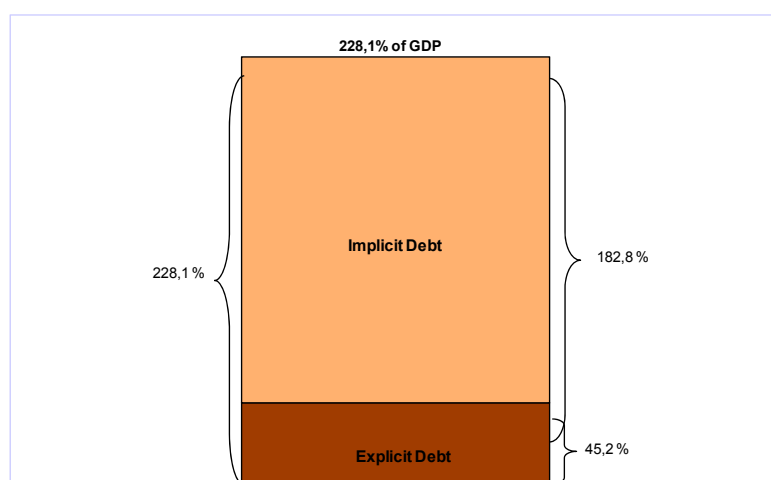
⁹⁰ It is important to stress that in this step of our computations, of course, the ageing of the population is taken into account.

⁹¹ Since our study is the first to analyze the sustainability of Polish public finances with the method of GA, the comparability with other studies is possible only to a small extent. The cross country comparison is also difficult. While the 2007 base year applied in our case is relatively ‘fresh’ (2007), available studies for other countries end up at updates for the base year 2005. In a future update of this study we would like to give such a cross country comparison which could base on preliminary work of the RCG, see e.g. Hagist et al. (2009) or Moog et al. (2010).

for isolated subsystems: Polish public finances are not sustainable. Even after the profound reform measures of recent years the fiscal system cannot be continued in the long run and certainly further reforms are needed in the light of a rapidly ageing society.

Of course, the results are accompanied with a considerable amount of uncertainty, especially regarding the growth and discount rate but also concerning the demographic development. Nevertheless, the sensitivity analysis indicates that the qualitative conclusion does not change if reasonably different presumptions are taken (see chapter 6.1). Also in these cases the present Polish fiscal policy is not sustainable.

Figure 65: Sustainability gap for Poland, $g=1,5\%$, $r=3,0\%$, 2007, % of GDP



Source: own calculations

An indicator illustrating the intergenerational burden is the FGB. We will recall that it shows the unfunded burden to be carried by future newborns. With this indicator we assume that the sustainability gap (see Figure 65) is closed only by future generations – born after the base year. The column of the “-1 year old” is a representative of these future generations. In comparison to the “0 year old” it outlines the intergenerational redistribution. In the case of Poland a newborn after the base year has to bear an additional fiscal burden of about PLN180,000.⁹² In other words, this future newborn would have to pay PLN 180,000 more than the “zero year old” over his remaining life cycle in order to close the sustainability gap.

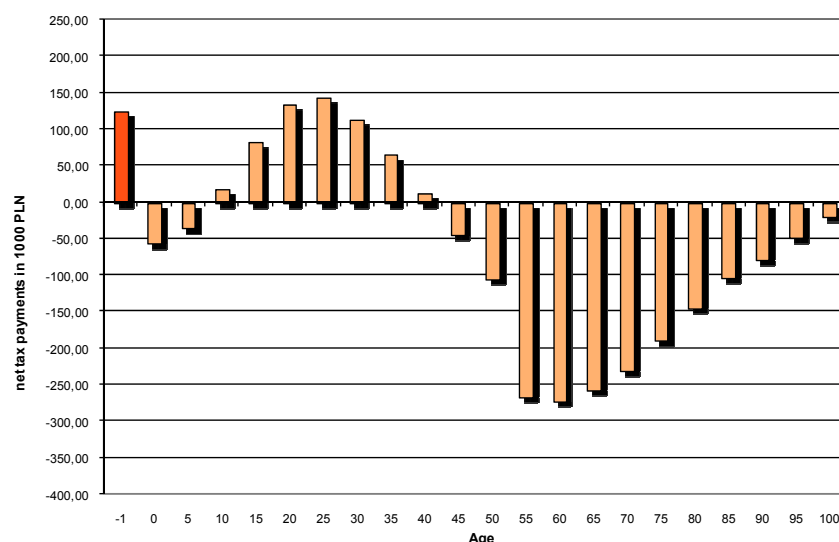
A further indicator, the revenue gap gives an answer to which extent an increase in taxes and other revenues can close the sustainability gap. In the case of Poland in 2007, revenues (for present and future generations) needed to be increased considerably by 12% in order to guarantee a sustainable fiscal policy. The other final indicator to be analyzed is the transfer gap. It shows to which extent general government transfers should be trimmed to close the sustainability gap. According to our estimates, benefits (of present and future generations) have to be reduced by 11% to close the sustainability gap. Also these indicators illustrate that there is a need for fiscal changes to stabilize Polish public finances in the long term.

The sustainability gaps of isolated sub-systems give a better picture of the main drivers for the Polish overall implicit debt. The gaps for our *standard isolation approach* are illustrated in Figure 67. Looking at this chart, first of all, its interpretation should be made clear. These

⁹² This number is simply derived by subtracting the Generational Account of the „zero year old” (-55,000 PLN) from its counterpart born one year after the base year (125,000 PLN).

gaps were elaborated with the assumption of a lack of external financing (only own resources on the revenue side). In other words, e.g. in the case of ZUS only pension contributions paid and pension benefits received have been considered. The significant amount of tax inflow into ZUS in the base year has not been taken into account. We shall therefore start the discussion of the results in Figure 67 with the systems which depend in the base year to a large extent on external financing: ZUS, farmers and miners.⁹³ For these systems the isolated gaps indicate that they will also depend heavily on tax inflows in the future – if no major reform steps are taken.

Figure 66: Future Generations' Burden for Poland, $g=1,5\%$, $r=3,0\%$, 2007, in thousand PLN



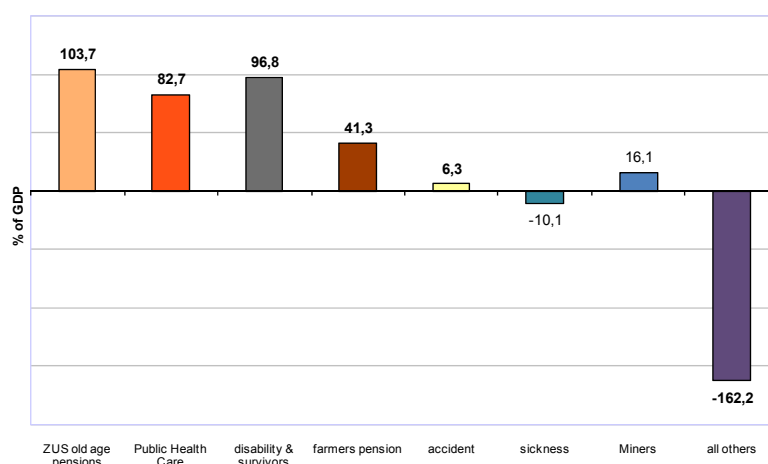
Source: own calculations

In the case of the ZUS old age pension system the considerable mismatch of contributions and expenditures in the coming decades bears a challenge for the Polish fiscal policy. These transformation costs of the 1999 reform – described more closely in chapter 4.1 – explain mainly the large sustainability gap of ca. the base year GDP. It should be underlined here that in the long run – as showed in chapter 4.1.2.5 – contributions can almost cover expenditures in the ZUS pension system.

In the case of farmers and miners, these fiscal systems would generate a significant sustainability gap if external financing were not to be prolonged in the future. The farmers system would accumulate a sustainability gap of 41% and the miners system of 16% of the base year GDP. The message from this exercise is that despite assumed future shrinking of the miners and farmers sectors also in the coming decades their entitlements have to be financed to a large degree by tax inflows.

⁹³ The education and civil servants system which are entirely financed by taxes will be tackled later.

Figure 67: Isolated Sustainability Gaps of the parafiscal and other subsystems
– standard isolation approach –



Source: own calculations

What becomes clear in Figure 67 is that especially the health care and disability system “contribute” to the long-term instability of Polish public finances. If we project the contribution and expenditure structure of the base year into the future the disability system would generate a sustainability gap of nearly 100% of GDP. We will see later that this isolated gap is mainly caused by the deficit in the base year. For the health care system the implicit debt amounts to about 80% of GDP. Here it should be noted that the latter system is based on relatively conservative assumptions. In the case of the so called cost pressure scenario the public health care system could even turn out be the most unsustainable of all systems (see chapter 4.5). Only the isolated sickness insurance fund and education system can generate a wealth over the coming decades. This is mainly due to the future decrease of their beneficiaries. Most benefits of the sickness fund are paid out to the shrinking working population, and with dropping fertility rates current spending for pupils will become exaggerated from a purely accounting point of view.

Projecting the residual of all other parts of Polish public finances into the future would imply a significant implicit wealth of about 160% of the base year GDP – see bar ‘all others’. This stems mainly from the fact that in the standard isolation approach we did not consider any tax inflows. This significant amount of tax revenues – reflected in the column ‘all others’ – is more than enough to cover the expenses of the residual parts of public finances. Of course, policy makers in the future can decide how to use this tax money, e.g. to cover the transformation costs of the pension system or to finance the increasing health care expenditures. Nevertheless, under the present fiscal rules one thing seems obvious: future tax inflows will not be sufficient to cover the sum of all isolated sustainability gaps. Summing up all isolations given in Figure 67 the overall implicit sustainability gap of Polish public finances still amounts to about 180% of the base year GDP.

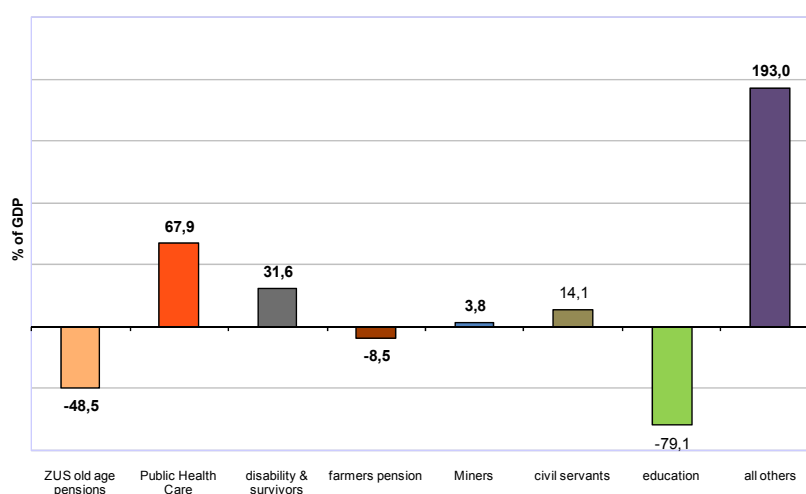
At present some fiscal systems are financed to a large degree by the state budget. So the crucial question is whether we should project this tax inflow, too, when isolating the respective fiscal system into the future. According to the legal rules of the status quo there is no binding and clear rule that deficits shall always be covered by the state budget.⁹⁴

⁹⁴ E.g. in the case of ZUS the deficit can also be covered from other sources: short term loans from the banks or expected one-off capital injections from the Demographic Reserve Fund.

Therefore, we do not include tax inflow, and any other form of additional financing in the standard isolation scenario. But is this a politically realistic scenario? Most probably, also in future budgetary years one will observe large tax inflows into ZUS and other fiscal subsystem such as the farmers and miners system. Therefore, we apply a second isolation approach in the following Figure 68. Whilst Figure 67 is based on the 'pure' own resources principle, Figure 68 assumes a balanced cash budget in the base year for each isolated subsystem. In other words we disregard the mismatch of contributions and expenditures in the base year in the *balanced budget approach*. It may be worthwhile adding that in such a scenario the revenue side consists of two separately developed profiles: already analysed own resources profile with the specific structure of contributors and their contributions. The other part of the revenue side, so to say the compensating part that simply balances in cash terms the isolated subsystem in a base year, consists of a flat per capita population profile, as in the case of civil servants or education. This second part holds its residual value only in the base year, as later on it lives its own 'life', independent of the development of actual deficit or surplus stemming from the difference between age and gender specific own resources and expenditures. The aim of this scenario is first of all to examine whether the present additional (compensating) revenue inflow will also be required in the long term. E.g. in the case of miners we intend to analyse whether the present tax inflow will be sufficient to guarantee the fiscal long term stability of the miners' social security system. Of course, also in the balanced budget approach reforms as well as the ageing process and transformation specific trends are taken into account. The factor which is knowingly neglected is the respective base year deficit of the sub-system analyzed.

The balanced budget scenario also suits another aim. It helps to make the outcomes for the civil servants' social assistance system as well as education system (methodologically) comparable with other systems which rely on primarily own resources. As pointed out in chapter 3 these two systems, the education and the civil servants system, are the only isolated fiscal entities which are financed solely by taxes and not own contributions. Therefore, for these 'special' schemes it is only feasible to apply the balanced budget approach.

Figure 68: Isolated Sustainability Gaps of the parafiscal and other subsystems (in balanced cash budget scenario)



Source: own calculations

It is interesting that in the case of old age pensions paid by ZUS the assumption of an unchanged level of external support transforms the ZUS sustainability gap into implicit wealth. This confirms to some extent our suggestions from the chapter devoted to NDC cash flows: in the coming decades ZUS will have to bear the double burden of 1) phasing out the generous old system and 2) additionally lowering the contribution basis (from 19.52 % to 12.22 %). However, after this unpleasant transformation period contributions can almost match expenditures. In other words, after the year 2028 the government supports for ZUS can be most probably gradually reduced. So, as assumed in Figure 68, ZUS would generate a considerable wealth of about 50% of the base year GDP.

If policy makers decided to keep the large financial support to miners from the base year, the virtual miners' subsystem would be almost balanced over time despite the ageing process. We explain this sustainability improvement by the gradually decreasing number of working miners. On the one hand the present per capita tax inflow into the miners social security system is not needed since there will be simply fewer participants in this sector. However, on the other hand this trend cannot totally outweigh the increasing burden of the ageing process – we still have some (though relatively slight) instability in the long term.

In the case of the healthcare system, which is almost balanced in cash terms in the base year – but for a relatively small part of missing contributions paid by certain groups, like farmers – the lack of stability remains almost unchanged. The drop of around 10 percentage points does not firmly improve the poor financial prospect of the healthcare system. We shall recall here a very probable cost pressure scenario, which doubles the expected implicit fiscal burden of the public health care system.

Contrary to the healthcare system, the disability fund can substantially improve its long term stability in the case of the balanced budget scenario – by 60pp. of the base year GDP. This stems from the fact that the disability fund showed a significant deficit in the base year. Of course, when neglecting this mismatch of contributions and expenditures in the long term stability of this system improves. Nevertheless, still a considerable sustainability gap of 32% of the base year GDP remains.

Furthermore, we can see that, if the government support to farmers remained unchanged, the fund would indeed significantly gain stability. In other words, with the gradual outflow of farmers from this system, the present government support would be more than sufficient in the long term.

Civil servants social benefits' scheme and education were already based in the first place on the assumption of a balanced 'own' budget in the base year (for an explanation see the respective chapters). The sustainability gap of civil servants 'fund' is relatively remarkable considering its low share of overall government expenditures in the base year (about 2.5%). The perspective of the education system turns out to be relatively promising. Contrary to the other system it can generate a remarkable "demographic dividend" due to the ageing process. More precisely, the expected low fertility rates, which translate into fewer pupils, will generate considerable accounting savings in the future.

Coming to a conclusion, a closer look on the isolated fiscal systems has shown that the stability of the subsystems of public finances is relatively heterogeneous. Especially the health care system but also the disability system turns out to be rather unsustainable. In the standard isolation approach we do not consider external financing such as taxes since the legal status quo gives no rules to project these extra revenues. If we however, deviated from this approach and gave as a reference the balanced budget scenario further information can be derived about future public finances. On this basis we could e.g. show that the present values of tax inflow into the education system but also into the general pension system will not be required in the long run.

6. Conclusions and outlook

In the coming decades Poland will be severely confronted by an ageing population. No other EU country (except Slovakia) will experience such a rapid rise of the number of elderly people relative to the working population. With this study we aimed to assess the impact of this ageing process on the long term stability of Polish public finances. Within this context we wanted to address the question whether recent fiscal reforms – and in particular the profound pension reform of 1999 – are sufficient to prepare Polish public finances for the upcoming ageing process. In comparison to other GA studies we, furthermore, aimed to focus on a special characteristic of the Polish economy: the ongoing transformation process. When analyzing the fiscal system of Poland one has to bear in mind that the past shrinking of the farming and mining sector can be most probably also observed in the coming decades. We, therefore, tried to comprise such transformation specific features into our computations.

Looking at the overall fiscal system the results are clear cut: Polish public finances are not sufficiently prepared for the upcoming ageing process. If the present fiscal policy were prolonged into the future considerable debts would be accumulated. Due to our calculations the fiscal gap of the entire public finances amounts to 228% of GDP (in 2007). This number can be interpreted as the amount which would have to be set aside today in order to sustain the present fiscal policy in the future. Of course, one can argue that this outcome is rather sensitive to the chosen assumptions: mainly the discount and the growth rate as well as demographic presumptions. The authors are, therefore, very open to a debate on the quantitative results. Nevertheless, though one might twist and turn the (reasonable) assumptions, the qualitative statement remains the same: present Polish fiscal policy is not sustainable.

A closer look on subsystems is highly valuable. It illustrates which fiscal systems are the main drivers of the unsustainability of public finances and which systems are prepared for the upcoming ageing process. We started our analysis with the general pension system – the biggest item of Polish public finances. Due to our calculations the comprehensive pension reform of 1999 remarkably improved the fiscal long term stability. The virtue of the new NDC system – in terms of sustainability – is that it automatically adjusts pension benefits to the future demographic development. On the basis of the 1999 reform future expenditures can be almost entirely covered by future contributions. However, this statement only holds in the (very) long-term! The challenge for policy makers lies in the coming 20 years. In this period the increase of total pension expenditures will be considerably higher than the growth of pension contributions leading to an increasing deficit of ZUS until 2030. The reason for this development lies in the “quadruple burden”: 1) high pension entitlements of the old generous pension system 2) for an increasing number of elderly people have to be paid by 3) lowered contributions of a 4) decreasing number of contributors. In other words, ZUS will require a considerable and increasing amount of additional inflows in the nearer future. How these financing gaps of future budgetary years are bridged – it has to be decided by politicians. In the course of the intended accession to the euro area a further considerable extension of tax inflows into ZUS is probably not desired by policy makers. Against this background our study quantified the impact of two recently discussed reform proposals: 1) an increase of female retirement age and 2) a partial switch of pension contributions from the funded (FDC) to the unfunded pension scheme (NDC). We demonstrated that these reform measures can partially bridge the cash deficits in the coming decades.

One major driver of the long term fiscal system could play a key role in the instability of the public health care system. According to our estimates – which differ to some extent from the Ageing Working Group – future health care expenditures in Poland will rise rather considerably due to the rapid ageing process. The results are even more serious when considering the so called medical technical progress. In order to bridge these expenditures contribution rates would have to rise from the present 9% to 15% (20%) until the year 2050 in the standard scenario (in the medical technical progress scenario). Against this background

policy makers will have to choose in the coming decades between an increase in health care revenues – via higher contribution rates and/or extra budget funding – and/or a cut in health expenditures to close arising fiscal gaps.

Also the fiscal sustainability of the disability fund is questionable in the long run. This is to some extent caused by a cut in contribution rates which led to a significant deficit in 2009. Yet, not only the weak revenue side could cause a future financing gap but also the increase of future expenditures – namely of survivors' pensions. However, regarding the disability fund it should be underlined that our computations are limited. Due to data constraints not all aspects of the 2006 reform have been considered.

Remarkable is the influence of the expected transformation process on the Polish fiscal sustainability. Based on national estimates we aimed to project a further outflow of contributors from the farmers' and miners' social insurance systems into the general social security system – namely ZUS. According to our computations this transformation will improve the long-term stability of the overall public finances. The explanation lies, simply speaking, in a relative sustainability of the general social security systems vis a vis the farmers (miners) system. In the coming decades a higher proportion of the population will be insured in the relatively more sustainable ZUS system and fewer citizens will participate in the relatively unstable KRUS (miners) system.

A fiscal system which can generate a significant wealth in the future – assuming constant per capita expenditures – is the education system. It is the only subsystem – besides the insurance fund for accident at work – which can considerably profit from the expected demographic ageing, namely from the low fertility rates, which translate into a decrease in the number of pupils. The interesting question of the coming years will be therefore how will politicians spend this “demographic dividend”, on an increase of (per capita) education expenditures or covering the deficits of other fiscal systems?

The authors are well aware that this first GA-sustainability study can only give a first picture of future public finances in Poland and there are certainly further possibilities for improvements of our computations.

As in every projection the quality and availability of data is vital to the accuracy of results. While for e.g. pension expenditures the available data were very satisfactory, this statement does not hold for various tax categories such as CIT and real estate taxes. Future research should therefore try to gather more precise age- and gender-specific micro data on these important parts of government revenues.⁹⁵ Generally, various occupation groups showed in recent decades waves of employment. As a result, the population of these professions – like e.g. civil servants – does not follow the general population structure. Due to a lack of data we could not take this into account for teachers and civil servants. Future research could, therefore, be based on actual sub-populations in order to generate more precise results. In this context also occupation specific life tables could be applied. A further improvement concerns the quality and availability of income profiles. For some professions such as teachers and farmers additional information on the income structure per cohort would allow more exact forecasts. In this context also the deviation of the income profiles created on the basis of data provided by ZUS from respective data based on the household survey (2006) should be further examined.

In the course of this study we focused on the reformed ZUS pensions system and the ongoing transformation process. Future research could examine some other features of government finances in greater detail. We would e.g. propose to analyze more thoroughly

⁹⁵ We also still lack precision of numerous smaller revenue parts of government finances like contributions for the Labour Fund (in fact unemployment contributions). Additionally, farmers' social insurance could be more exactly reflected in our computations with additional data on the possible income structure per cohort. This would allow more exact forecasts on e.g. the contribution inflows from richer farmers.

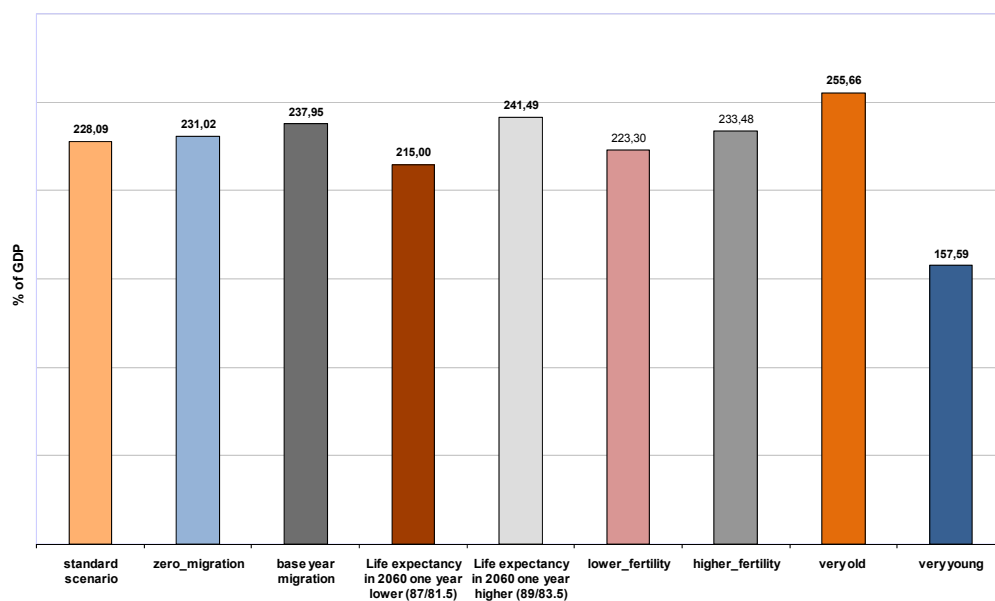
the impact of the profound disability reform of the year 2006. On the basis of ‘fresher’ micro data – which encompasses a more detailed account of the effects of this reform – we could considerably improve our estimations for this scheme of public finances. Future research could also put a stronger emphasis on the public health care system – which according to our outcomes is a major driver of the unsustainability. Since our study diverges from AWG2009 health results we would strongly recommend a closer comparison and exchange with the AWG, especially on the data applied but also on the assumptions and methodology. In 2007 only 0.6% of elderly people (aged 60+) have been cared for in nursing homes in Poland. Other EU-countries such as Sweden (7.2%), Netherlands (5%) or Spain (3.4) showed significantly higher levels. Further research could, therefore, also examine the fiscal impact of a possible rise of in-patient care to the EU-average. The core of our study was to analyze the effects of the ageing process on Polish public finances, employment trends have only been partially considered. Future studies could focus more on the future labour market, e.g. on the impact of higher female participation rates on different social security systems.

As outlined above our computations can clearly be improved further and extended in various directions. Against this background, we hope that this initial GA study for Poland will be a valuable fundament for discussion and further research.

Appendix 1: Sensitivity Analysis

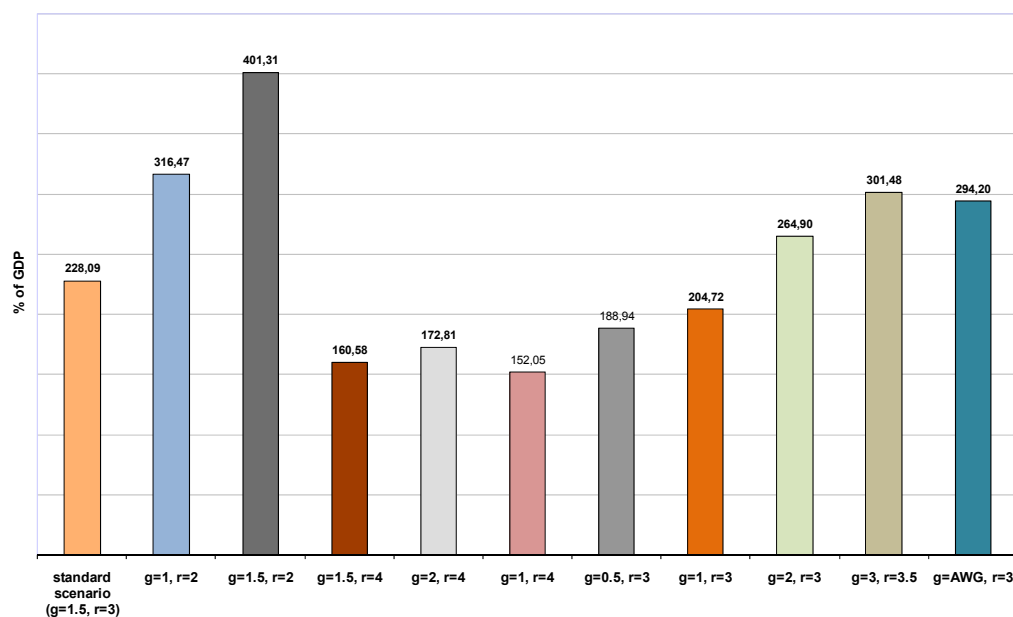
On the next pages the sensitivity analysis of our results is presented in Figure 69 and Figure 70:

Figure 69: Demographic sensitivity analysis for the sustainability gap of the entire Polish public finances, 2007, $g=1.5\%$, $r=3\%$



Source: own calculations

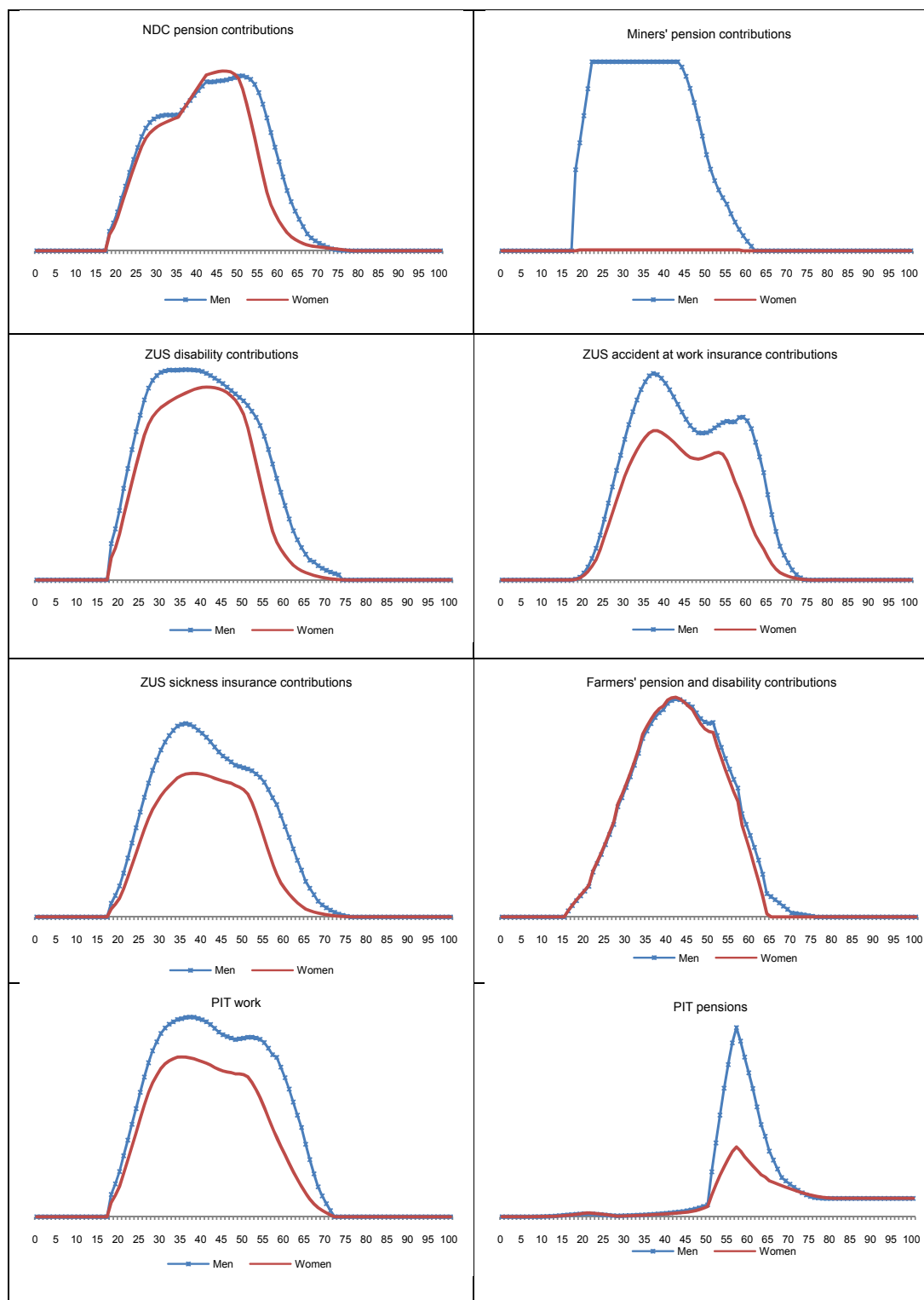
Figure 70: Sensitivity analysis of the growth and discount rate for the sustainability gap of the entire Polish public finances, 2007, $g=1.5\%$, $r=3\%$

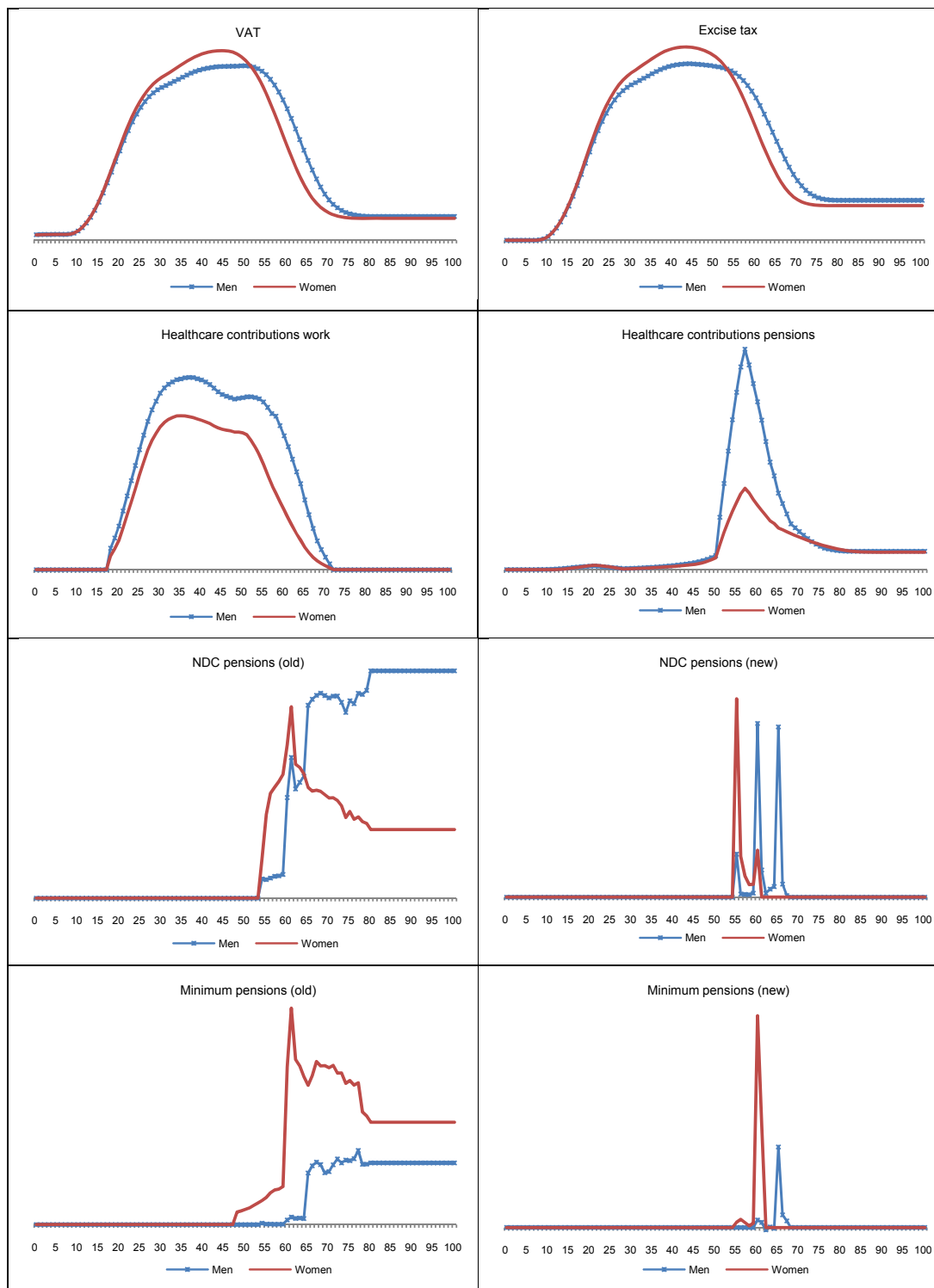


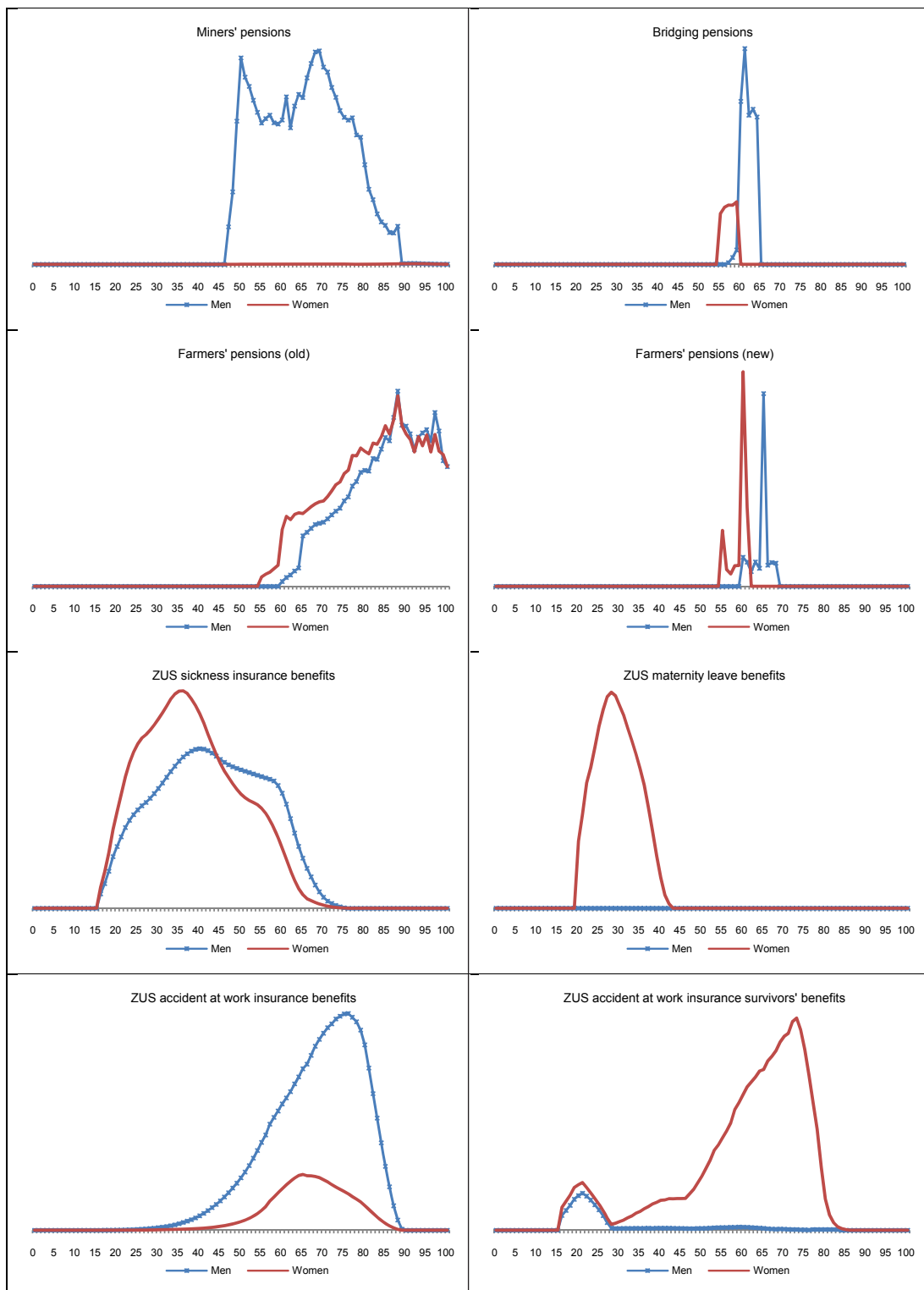
Source: own calculations

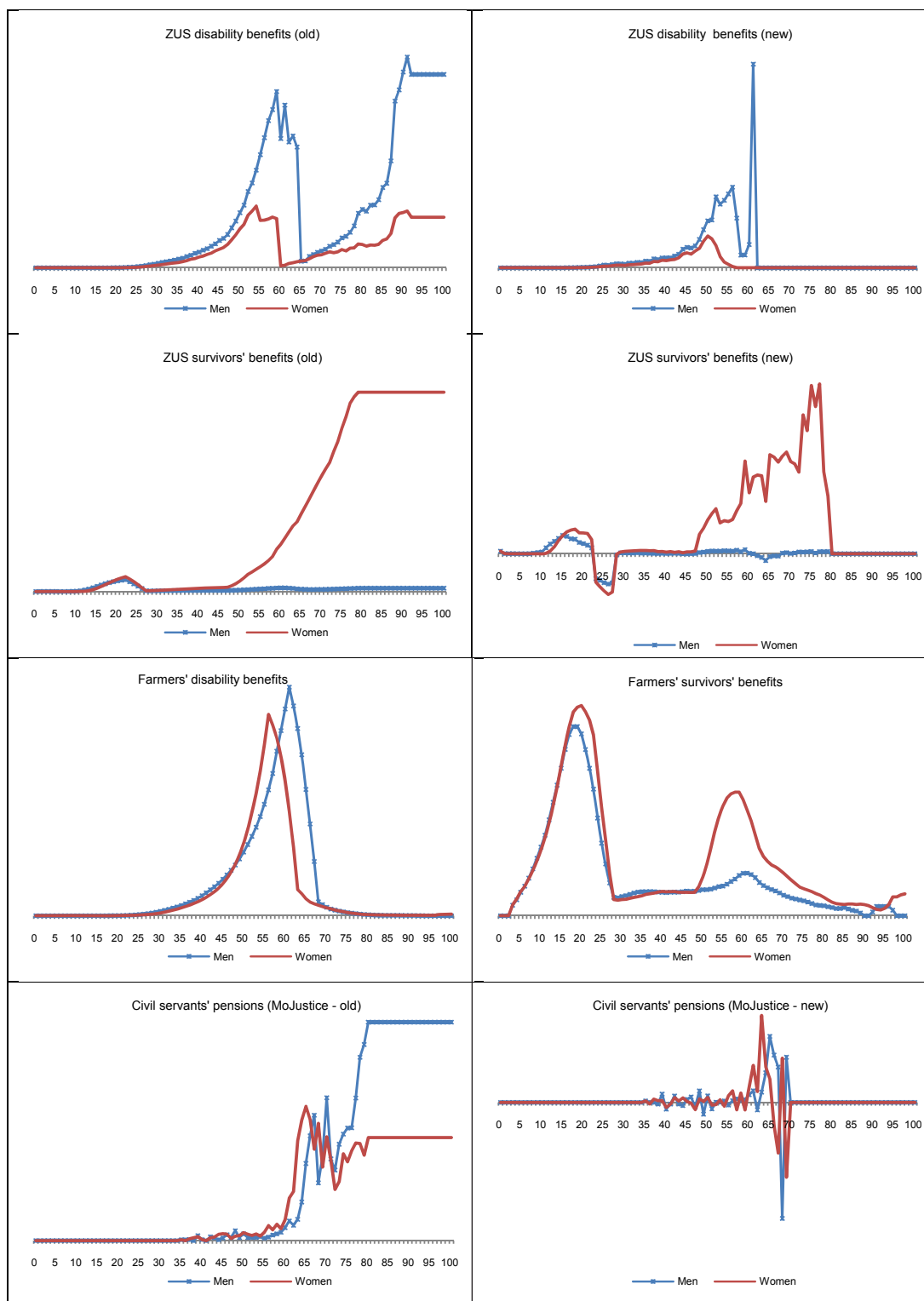
As plotted in Figure 69 the sensitivity analysis shows little elasticity of the sustainability gap to changing migration, life expectancy or fertility rate assumptions. The assumptions taken in these scenarios are described in detail in chapter 3.2.1. Most significant changes can be observed if the discount rate is changed. It also becomes clear that in fact the differential between the discount and the growth rate has the biggest influence on the results – see Figure 70.

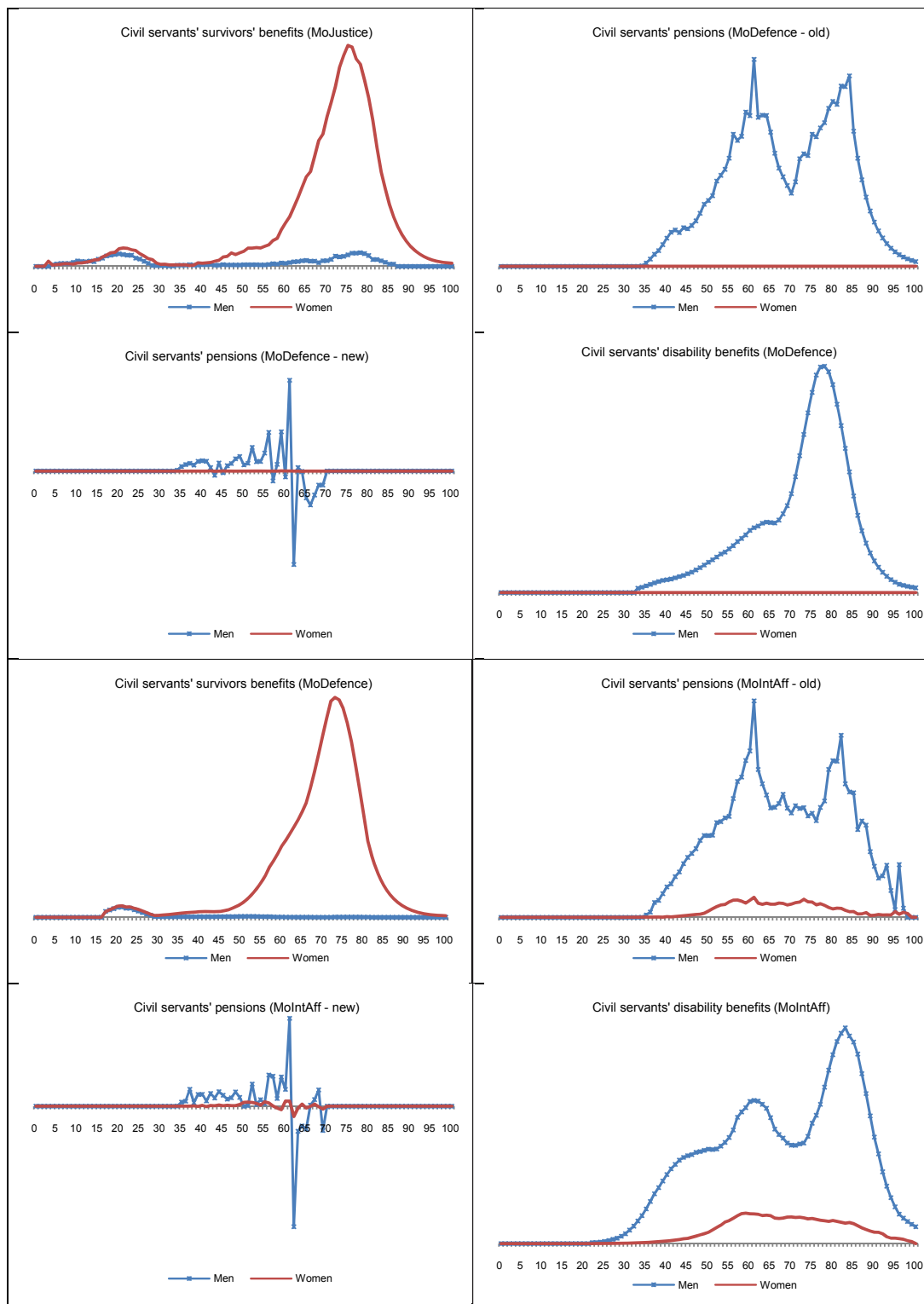
Appendix 2: Applied micro profiles

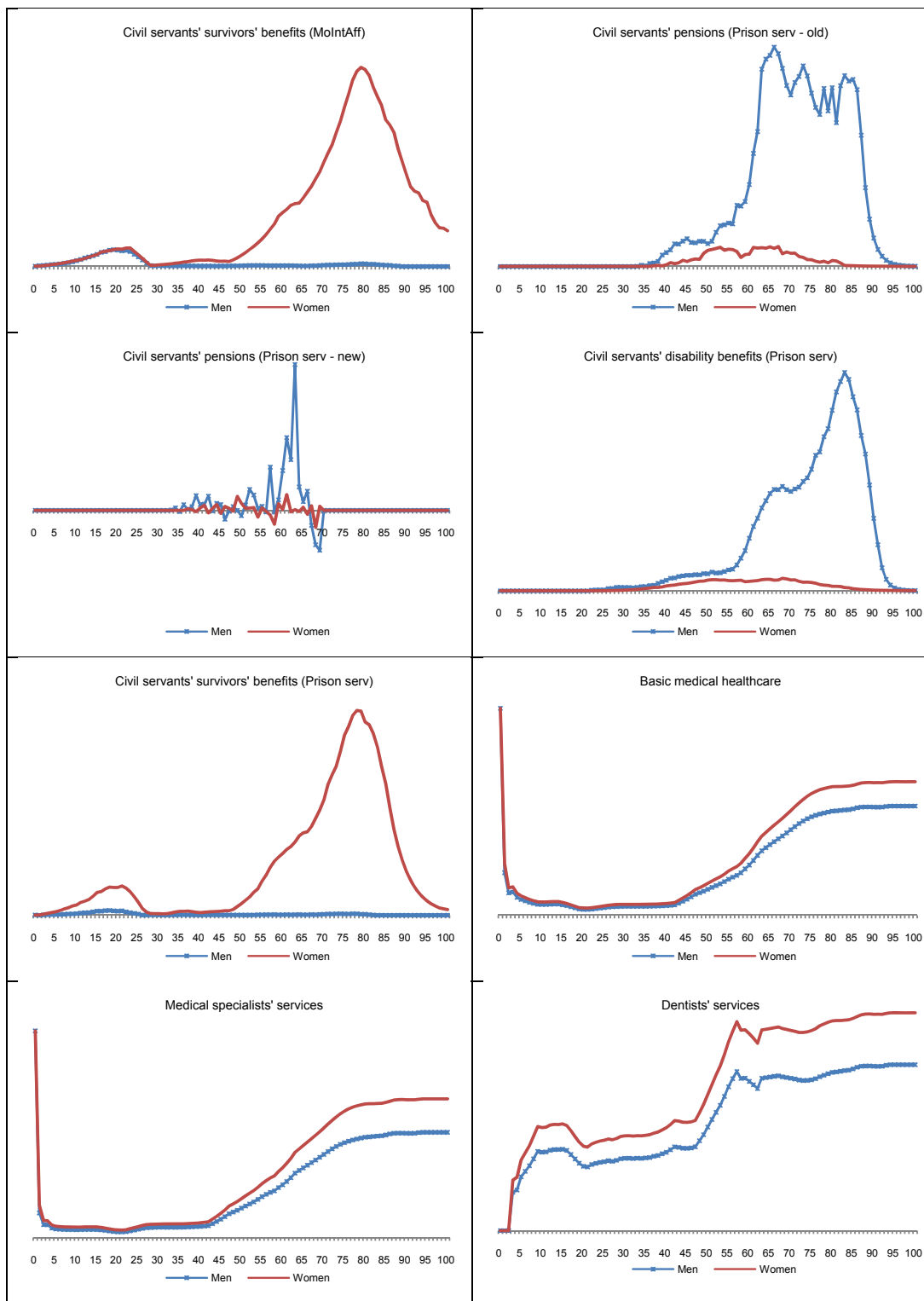


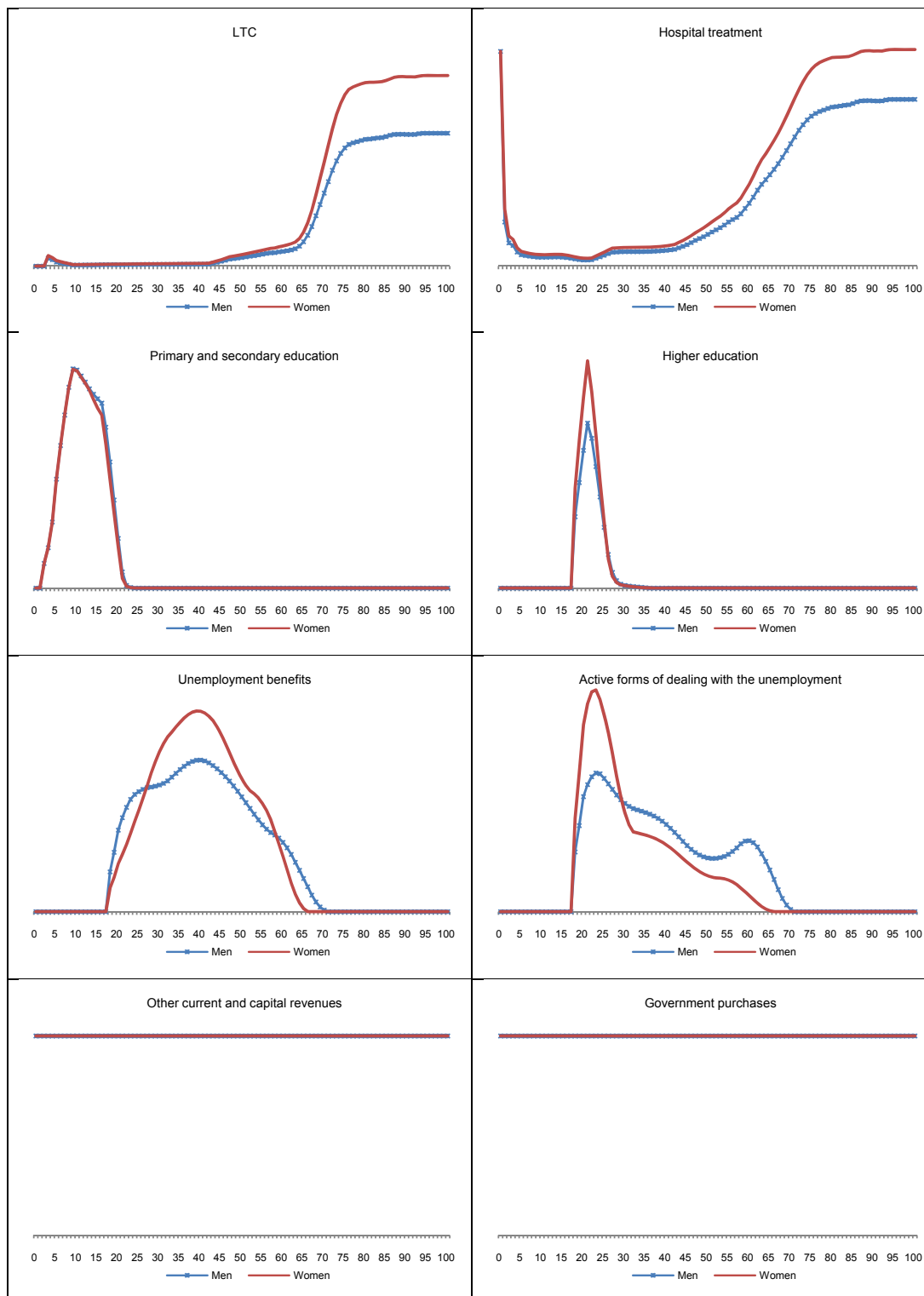












References:

- Act on bridging pensions (2008), Background document (31/12/2008).
- Alho, J. and R. Vanne (2006), On Stochastic Generational Accounting, in: Gauthier A., C. Chu and S. Tuljapurkar (eds.), *Allocating Public and Private Resources across Generations – Riding the Age Waves – Volume 2*, Berlin, 291-302.
- Auerbach, A. J., Chang, Y. J. (2003), Generational Accounting in Korea, NBER WP, no. 9983.
- Baker, B., D. Besendorfer, and L. Kotlikoff (2002), Intertemporal State Budgeting, NBER Working Paper No. 9067, Cambridge.
- Barro, R. (1974), Are government bonds net wealth?, *Journal of Political Economy*, 82 (6), 1095-1117
- Barro, R. J. (2001), Human Capital and Growth, *The American Economic Review*, Vol. 91, No. 2, Papers and Proceedings, 91 (2), 12-17.
- Benz, T. and C. Hagist (2010), Der Rücklagenbedarf der Versorgungsausgaben in Baden-Württemberg - Projektion und Reformoptionen, Discussion Papers, 42/10, Research Center for Generational Contracts, Freiburg University, Freiburg.
- Benz, U. and S. Fetzner (2006), Indicators for Measuring Fiscal sustainability: A Comparison of the OECD Method and Generational Accounting, *FinanzArchiv*, 62 (3), 367-391.
- Bonin, H. (2001), *Generational Accounting: Theory and Application*, Berlin.
- Breyer, F. and S. Felder (2006), Life Expectancy and Health Care Expenditures in the 21st Century: A New Calculation for Germany Using the Costs of Dying, *Health Policy*, 75 (2), 178-186.
- Breyer, F. and V. Ulrich (2000), Gesundheitsausgaben, Alter und medizinischer Fortschritt: eine Regressionsanalyse, *Jahrbuch für Nationalökonomie und Statistik*, 220(1), 1-17.
- Buiter, W. (1995), Generational accounts, aggregate saving and intergenerational distribution, Centre for Economic Policy Research Discussion Paper Series, No. 237.
- Buiter, W. and K. Kletzer (1995), Capital mobility, fiscal policy and growth under selffinancing of human capital formation, Centre for Economic Policy Research Discussion Paper Series, No. 1179.
- CBO – Congressional Budget Office (1995), *Who pays and when? An assessment of Generational Accounting*, Washington D.C.
- Central Statistical Office (2005, 2006, 2007, 2008), *Employment in national economy*, Warsaw.
- Central Statistical Office (2006, 2007, 2009), *Higher education institutions and their finances in 2005, 2006, 2007, 2008*, Warsaw.

- Central Statistical Office (2007), Healthcare in households in 2006, Warsaw.
- Central Statistical Office (2007), Structure of wages and salaries by occupations in October 2006, Warsaw.
- Central Statistical Office (2007), Transition from work into retirement, Warsaw.
- Central Statistical Office (2007, 2008), Demographic Yearbook of Poland.
- Central Statistical Office (2007, 2008), Employment, wages and salaries in national economy in first (second, third, fourth) quarter 2007, Warsaw.
- Central Statistical Office (2008), Demographic Yearbook of Poland, Warsaw.
- Central Statistical Office (2008), Household Budget Surveys in 2007, Warsaw.
- Central Statistical Office (2008), Structure of agricultural holdings in 2007, Warsaw.
- Central Statistical Office (2008, 2009), Education in the school year 2006/2007 & 2007/2008, Warsaw.
- Central Statistical Office (2009), Beneficiaries of social welfare and family allowances in 2008, Warsaw.
- Central Statistical Office (2009), Labour force survey in Poland in the years 2003-2007, Warsaw.
- Central Statistical Office (2009), Roczne mierniki gospodarcze.
- Chancellery of the Prime Minister of the Republic of Poland (2009), Poland 2030, Warsaw.
- Chancellery of the Prime Minister of the Republic of Poland (2010), Plan Rozwoju i Konsolidacji Finansów 2010–2011 (Propozycje), Warsaw.
- Chłoń, A., Góra M., and Rutkowski M. (1999): Shaping Pension Reform in Poland: Security Through Diversity, Social Protection Discussion Paper Series, No. 9923, World Bank Publishing, Washington, D.C.
- Chłoń-Domińczak, A. (2006), Pension reform in Poland impact on retirement incomes, http://www.euro.centre.org/data/1166615586_49422.pdf, 11.06.2010
- Cutler, D. (1993), Review of Generational Accounting: Knowing Who Pays, and When, for What We Spend, *National Tax Journal*, 46 (1), 61-67.
- Deeg, V., Hagist, Ch., Moog, S. (2009), The Fiscal Outlook in Austria – An Evaluation with Generational Accounts, *Empirica*, 4, 475-499.
- Diamond, P. (1996), Generational Accounts and Generational Balance: An Assessment, *National Tax Journal*, 49 (4), 597-607.
- Dormont, B., M. Grignon and H. Huber (2006), Health expenditure growth : reassessing the threat of ageing, <http://hal.inria.fr/docs/00/18/16/05/PDF/Dormont-Grignon-Huber-HE.pdf>, 10.06.2010.

EC, IMF, OECD, UN & World Bank (2009), System of National Accounts 2008. European Commission, International Monetary Fund, Organisation for Economic Co-operation and Development, United Nations and World Bank, New York.

European Commission (2007), Subject: Situation and prospects for EU agriculture and rural areas, Note for the file, Brussels.

European Commission (2009), Sustainability Report 2009, European Economy, Occasional Papers, 9, Brussels.

European Commission (2009), The Social Situation in the European Union 2008 New Insights into Social Inclusion, Brussels.

European Commission (2009), Update of Analysis of Prospects in the Scenar 2020 Study, Brussels.

European Commission (2009a), 2009 Ageing Report: Economic and budgetary projections for the EU-27 Member States (2008-2060), European Economy, Occasional Papers, 2, Brussels.

Eurostat (2008), Population projections 2008-2060. From 2015, deaths projected to outnumber births in the EU27, News release No. 119/2008, 26/8/2008.

Fehr, H. and L. Kotlikoff (1996), "Generational Accounting in General Equilibrium," *FinanzArchiv*, 53 (4), 1-27.

Felder, S. (2006), Lebenserwartung, medizinischer Fortschritt und Gesundheitsausgaben: Theorie und Empirie, *Perspektiven der Wirtschaftspolitik*, 7 (S1), 49-73.

Fetzer, S. (2006), Zur nachhaltigen Finanzierung des gesetzlichen Gesundheitssystems, Frankfurt.

Fries, J. (1980), Aging, Natural Death, and the Compression of Morbidity, *The New England Journal of Medicine*, 303 (3), 130-135.

Garber, A.M. and Skinner J. (2008), Is American Health Care Uniquely Inefficient? *Journal of Economic Perspectives*, 22 (4), 27-50.

Hagist, C. (2007), Generational Accounting in a stochastic environment – some useful results, Discussion Paper Series Forschungszentrum Generationenverträge (forthcoming).

Hagist, C. (2008), Demography and Social Health Insurance: An International Comparison Using Generational Accounting, Baden-Baden: Nomos.

Hayashi, F. (1985), The effect of liquidity constraints on consumption: a cross-sectional analysis, *The Quarterly Journal of Economics*, 100 (1), 183-206.

Haveman, R. (1994), Should generational accounts replace public budgets and deficits?, *Journal of Economic Perspectives*, 8 (1), 95-111.

Heidler, M., Müller, C., Weddige, O. (2009), Measuring accrued-to-date liabilities of public pension systems – method, data and limitations, Discussion Papers, 37/09, Research Center for Generational Contracts, Freiburg University, Freiburg.

Jabłońska-Porzuczek, L., Łuczka-Bakuła, W. (2007), The demographic structure of society and individual farmers' social insurance, August Cieszkowski Agricultural University of Poznań, Poznań.

Kotlikoff, L. (1997), Reply to Diamond's and Cutler's Reviews of Generational Accounting, National Tax Journal, 50 (2), 303-314.

Kotlikoff, L. (2003), Generational Policy, Cambridge.

Kotowska, E. I., Sztanderska, U., Wóycicka, I. (2007), Aktywność zawodowa i edukacyjna a obowiązki rodzinne w Polsce w świetle badań empirycznych, SCHOLAR, Warsaw.

Leifels, A. and J. Vatter (2010), Mit Bildungsinvestitionen zu einem tragfähigen Wohlfahrtsstaat? Österreich und Deutschland im Vergleich, Wirtschaftspolitische Blätter, (57)1, 49-63.

Leifels, A., C. Müller and B. Raffelhüschen (2010), Mind the pension gap – On the relationship between future pensions and pre-retirement consumption in Poland, Study on behalf of ERGO Versicherungsgruppe AG.

Marcinkowska, I., Ruzik, A., Strawiński, P., Walewski, M. (2008), Badanie struktury i zmian rozkładu wynagrodzeń w Polsce w latach 2000-2006, Ministry of Labour, and Social Policy, Warsaw.

Mello, L. de, P. Kongsrud and R. Price (2004), Saving behavior and the effectiveness of fiscal policy, OECD Economics Department Working Paper Series, No. 397.

Ministry of Finance (2008), Informacja dotycząca rozliczenia podatku od osób fizycznych za rok 2007, Warsaw, 2008.

Ministry of Finance (2010), Convergence Programme 2009 update, Warsaw.

Ministry of Finance (2010), Pierwszy pakiet reform dla konsolidacji finansów publicznych – propozycje dla Prezydenta RP, Warsaw.

Ministry of Labour and Social Policy (2008), Poland, Labour market and social security – macroeconomic performance in figures 1998-2007, Warsaw.

Ministry of Labour and Social Policy (2008), Polska 2008, Raport o rynku pracy oraz zabezpieczeniu społecznym, Warsaw.

Ministry of Labour and Social Policy (2008), Zatrudnienie w Polsce 2007, Bezpieczeństwo na elastycznym rynku pracy, Warsaw.

Ministry of Social Policy (2005), Strategia Polityki Społecznej na lata 2007-2013, Warsaw.

Modigliani, F. and R. Brumberg (1954), Utility analysis and the consumption function: an interpretation of cross-section data, in: Kurihara, K. (ed.), *Post-Keynesian Economics*, New Brunswick, 388–436.

Modigliani, F. and R. Brumberg (1980), Utility analysis and aggregate consumption functions: an attempt at integration, in: Abel A. (ed.), *The Collected Papers of Franco Modigliani: Volume 2, The Lifecycle Hypothesis of Saving*, Cambridge, 128–197.

National Healthcare Fund (2005, 2006, 2007, 2008), Annual Report, Warsaw.

OECD (1998), Long-term care services to older people, a perspective on future needs: the impact of an improving health of older persons, Working Paper AWP 4.2, Paris.

OECD (2006a), Projected OECD healthcare and long-term care expenditures, what are the main drivers?, Economic Department Working Papers no. 477, Paris.

OECD (2006b), *OECD Health Data 2006*, Paris.

Raffelhüschen, B. (1999), Generational Accounting: Method, Data, and Limitations, *European Economy, Reports and Studies*, 6, 17-28.

Raffelhüschen, B. and A. Risa (1997), Generational Accounting and Intergenerational Welfare, *Public Choice*, 93 (1), 149-163.

Sikorska, A. et al., (2009), Instrumenty oddziaływania Państwa na kształtowanie struktury obszarowej gospodarstw rolnych w Polsce; rola systemu ubezpieczenia społecznego rolników w kształtowaniu tej struktury. Stan obecny i rekomendacje na przyszłość oraz propozycje nowych rozwiązań dotyczących tego obszaru dla systemu ubezpieczeń rolników; expertise for the Ministry of Agriculture and Rural Development, Institute of Agricultural and Food Economics - National Research Institute (IAFE-NRI).

Social Insurance Institution (2005, 2006, 2007, 2008, 2009), Emerytury i renty górnicze (years 2004-2008), Warsaw.

Social Insurance Institution (2005, 2006, 2007, 2008, 2009), Emerytury i renty kolejowe (years 2004-2008), Warsaw.

Social Insurance Institution (2005, 2006, 2007, 2008, 2009), Emerytury i renty nauczycieli (years 2004-2008), Warsaw.

Social Insurance Institution (2007), Analiza wyników badania okresów pobierania emerytur i rent, Warsaw.

Social Insurance Institution (2009), Social Insurance in Poland, Information, Facts, Warsaw.

Social Insurance Institution (2009), Zasady podlegania ubezpieczeniom społecznym i ubezpieczeniu zdrowotnemu, ustalania podstawy wymiaru oraz rozliczania i opłacania składek na te ubezpieczenia oraz na Fundusz Pracy i Fundusz Gwarantowanych Świadczeń Pracowniczych, Warsaw.

Soszyński, K. (2009), Wpływ zmian w systemie ubezpieczeniowo-podatkowym na sytuację rolników indywidualnych oraz budżet państwa, VERBIS, Warsaw.

Statistical Bulletin of the Ministry of Healthcare (2007), Warsaw.

Survey on Healthcare, Ageing and Retirement in Europe (SHARE), database available upon request.

Verbrugge, L. (1984), Longer Life but Worsening Health? Trends in Health and Mortality of Middle-Aged and Older Persons, *Milbank Memorial Found Quarterly*, 62 (3), 475-519.

Wóycicka, I., (2004) Później na emeryturę?, *Niebieskie księgi, Rekomendacje* nr 16, IBnGR, Gdańsk.

Zweifel, P. (2003), Medical Innovation. A Challenge to Society and Insurance, *Geneva Papers on Risk and Insurance: Issues and Practice*, 28 (2), 194-202.